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Central Bank Balance Sheets Expansion: Japan's Experience

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Central Bank Balance Sheets Expansion: Japan's Experience

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Abstract

Facing the global financial crises, the central banks of developed countries have continued their monetary expansion and unconventional policy measures. Japan and Switzerland, for instance, have witnessed the appreciation of their home currency while the US dollar has kept its depreciation. The comparative values of currencies lead to different effects, depending on the exchange rate policies, export firms' choice of invoice currency and the price setting behavior of those firms, which all affect the terms of trade among the countries and the nations' welfare. Contrary to their initial impression of the public, a monetary expansion is not necessarily beneficial for the domestic welfare; the theories of new open-economy macroeconomics show their effectiveness for analyzing the ramification of monetary expansions in the contemporary globalized economy amid the financial distress, accompanied by fiscal expansions in many cases. Employing such theoretical development in macroeconomics, this paper attempts to clarify the recent behavior of central banks, the changes in the exchange rates and the effects on the welfare of those nations.

Keywords:

terms of trade, exchange rate, central bank, balance sheet, monetary expansion

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I. Introduction

With the onset of the Lehman's shock, central banks of advanced economies faced the zero bound of nominal interest rates and embarked on the unconventional monetary policy measures. The Bank of England was the first runner and initiated the large scale asset purchase program in March 2009. The move was followed by the Federal Reserve. The Bank of Japan instituted a new fund which purchases a variety of risky assets within a framework of "comprehensive easing policy" in October 2010.

Yet, prior to the Lehman shock, the Bank of Japan has accumulated the experience of the unconventional policy measures. It must be noted that the balance sheet expansion of central banks covers only one aspect of unconventional policy measures. In a second round of BOJ's unconventional policy measures during the period covering from December 2008 until today, the BOJ put emphasis on the aspect of credit easing and growth enhancement, as compared with the quantitative easing policy in a first round of policy measures.

The recent expansion of central banks' balance sheets was accompanied by depreciation in major currencies such as the US dollar, the euro and the pound sterling, with the exception of the Japanese yen and the Swiss franc. The expansion of central banks' balance sheet in advanced economies aroused the criticism by the governments of emerging economies. Mr. Mantega, the Brazilian Minister of Finance, accused of the US that aggressive expansion of the Federal Reserve's balance sheets caused "currency wars", because it invited the "beggar-thy-neighbor" effect through dollar depreciation on emerging economies.

Yet, Eichengreen and Sachs (1985) already pointed out that devaluations via monetary base expansion increased the global aggregate demand by lowering the world real interest rate. They argued that the beneficial effect was at least as important as the expenditure-switching effect through competitive devaluations.

Within a framework of "new open-economy macroeconomics" (NOEM), Obstfeld and Rogoff (1995) insisted that not only home economy, but also foreign economy benefits from monetary expansion in either country. They pointed out that the impact of changes in terms of trade and current-account on nation's welfare is of a second-order importance.

However, the terms of trade improvements cause the welfare-enhancing shift of national budget constraints. Corsetti and Pesenti (2008) elucidated in a graphical apparatus that the terms of trade changes can play a critical role in the international transmission of monetary policy. Depending on the difference in price setting behavior by exporters, the international transmission mechanism may be either positive or

negative.

This paper attempts to examine the impact of monetary expansion represented by the large scale purchase programs on welfare, domestic and abroad. We investigate the international transmission of monetary expansion through changes in exchange rate and the terms of trade, in the light of the Japanese experience.

The emerging economies may benefit from the lower world real interest rate and the improvement of terms of trade. However, aside from the added complication of macroeconomic policy management with respect to inflation and asset price bubbles in domestic economy, it is not excluded that the manufacturing production can be adversely affected due to the erosion of competitiveness,

Section II provides the international comparison of quantitative/credit easing policy adopted by advanced economies, in comparison with the Japanese experience. Section III reviews the long-term movement of the real exchange rate and the terms of trade in advanced economies. We investigate the relationship between the real exchange rate and the terms of trade in Section IV. Section V turns to the examination of the role of price setting behavior by exporting firms which is linked to the choice of invoice currency. Section VI discusses the difference in international transmission of monetary policy arising from the different price-setting behaviors by exporting firms. We evaluate the recent episodes of international transmission effect of monetary policy, based on the facts observed from developments of exchange rates and the terms of trade.

II. Size of Quantitative Easing/Credit Easing Policies

Bank of Japan

The first unconventional monetary policy started in March 2001 one week after the announcement by the Japanese government that the Japanese economy is in a “mild deflation” in the monthly economic report. Before the announcement, both the government and the Bank of Japan had not recognized a mild deflation of about one percent as deflation.

The first unconventional policy from March 2001 to March 2006 comprised several measures such as (1) the zero interest rate policy (ZIRP), (2) the quantitative easing policy (expansion of its balance sheet), (3) policy duration announcements and (4) the credit easing policy (composition changes in its balance sheet).

On the aspect of quantitative easing policy, the bank reserve target increased from ¥ 5 trillion to ¥ 32-35 trillion with the purchase of government bonds amounting to ¥ 18 trillion; thereby, the ceiling on government bond holdings was set to limit the purchase within the amount of the BOJ note outstanding at the time when the first round of QE

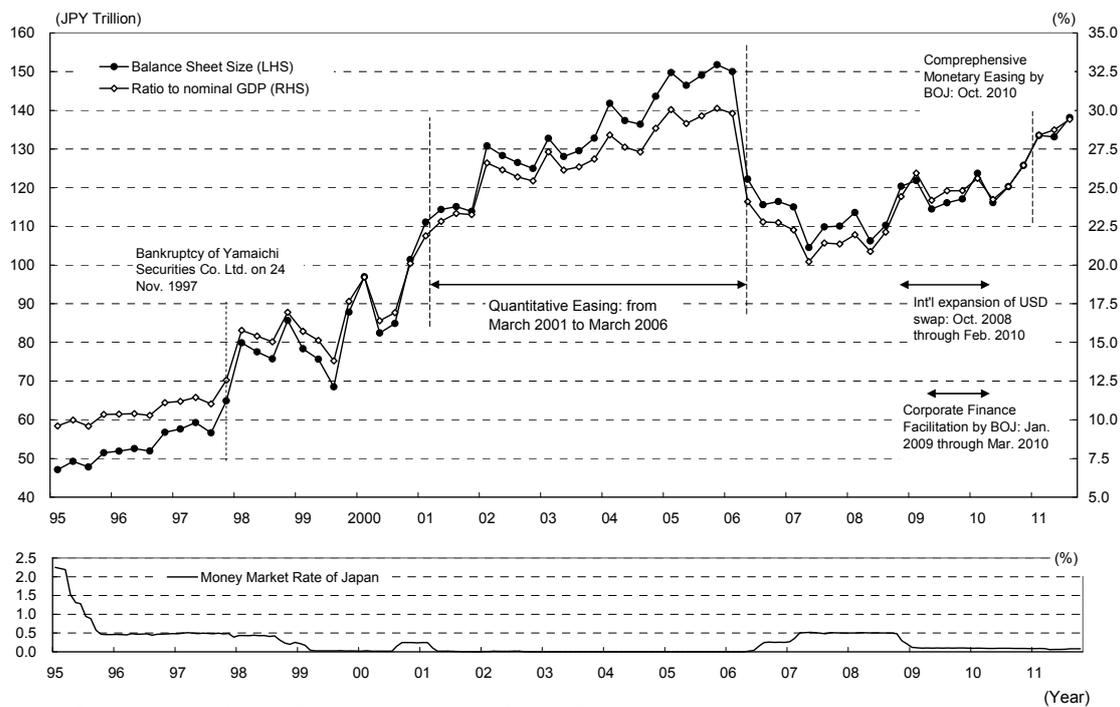
was initiated. The BOJ note rule was introduced under the premise that it will prevent the easy monetization of budget deficit (Shiratsuka (2009)). As a result, the unconventional policy measure was executed in a conventional way, because the BOJ took into account that the currency issue on the liability side is normally backed by the long-term assets on the asset side.

Supposedly, the BOJ was more cautious about the consequence of purchase of long-term government bond than other central banks, as the costs involved in the purchase of long-term bond and other risky assets was not indemnified by the Ministry of Finance. This makes sharp difference from the TARP of the US or the APF of the UK. The size of the BOJ's total assets increased by about ¥42 trillion; its ratio to nominal GDP expanded from 20% in 2001 to 30% in 2006 (Figure 1). But it should be noted that prior to the introduction of the QE, the size of BOJ's balance sheet had already started to expand since mid-1997 when the risk of financial crisis was intensified both in Japan and the Asian economies.

The commitment on policy duration was made within the framework of the quantitative easing policy (QE); the condition for exit from the QE was clarified in October 2003. It was decided that the QE will be maintained, until the core consumer price registers positive rate of changes in a stable manner^[1].

The credit easing policy included the purchase of ABS (Asset-Backed Securities), ABCP (Asset-Backed Commercial Paper) and the equities from financial institutions.

Figure 1: Balance Sheet Size of BOJ



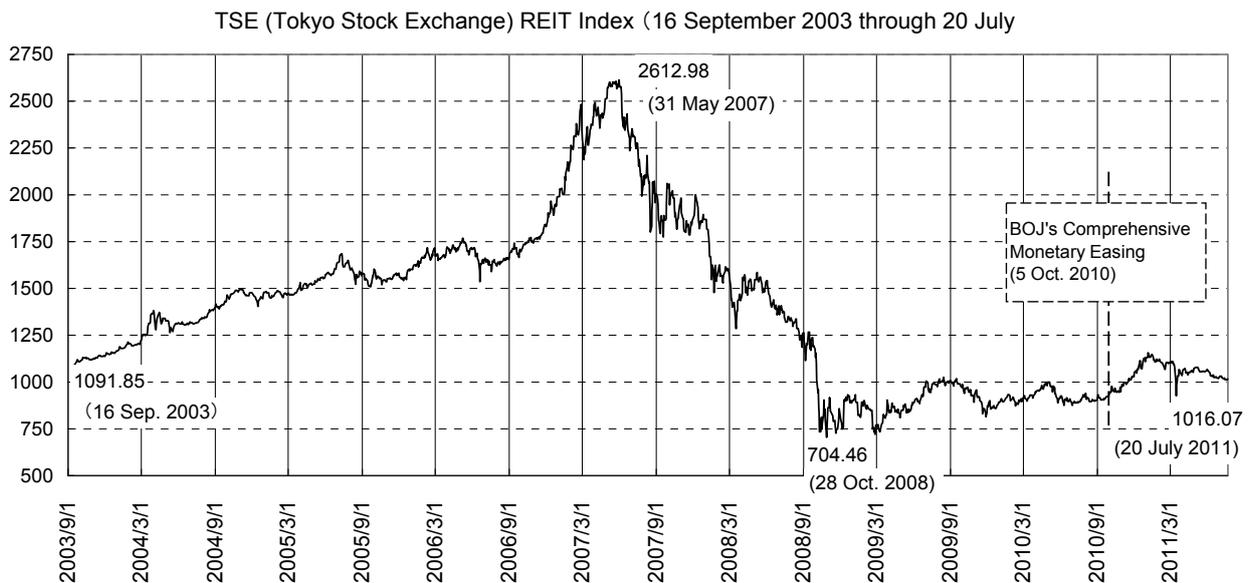
(Source) International Monetary Fund, *International Financial Statistics*; Bank of Japan

It must be noted that the purchase of equities was implemented as an instrument of macro-prudential policy; the Japanese private banks, as the main banks, held large amount of equities of customer firms. The collapse of equity prices endangered the maintenance of banks' capital base.

What was remarkable was a massive intervention policy implemented by the MOF (Ministry of Finance). From spring 2003 to spring 2004, the MOF engaged in a massive intervention on the foreign exchange market; the amount of intervention was about ¥35 trillion, with the implicit target rate ranging from ¥110 to ¥120 vis-à-vis dollar ^[2]. In between the amount of bank reserve target was raise by 15 trillion. This may imply that the Ministry of Finance virtually carried out the unsterilized intervention policy amounting to ¥15 trillion under the zero interest rate policy. The intervention policy supported by easing of monetary policy seemed to enhance the trend toward lowering the value of yen rate during the period of quantitative easing policy.

Moreover, in 2006 and 2007, the yen-carry trade maintained the depreciation tendency of the yen rate. Foreign banks could borrow the yen-denominated fund at negative interest rates on the short-term money market, due to their advantageous position over the Japanese banks on the international financial market. Given the BOJ's sustained zero interest rate policy, foreign banks borrowed the yen-fund at comfortably low interest rates, engaging in a carry trade through the interoffice accounts; it served to

Figure 2: J-REIT Index



(Note) TSE REIT Index measures the aggregate market value of the real estate investment trust at the end of each business day, regarding all the products on the Tokyo Stock Exchange. The benchmark value, 1000, was measured on 31 March 2003.

(Year / Month / day)

(Source) QUICK Corp.

fund the general increase in balance sheets of hedge funds and financial intermediaries at financial centers (Hattori and Shin (2007)).

After the bankruptcy of Lehman Brothers, the second unconventional monetary policy introduced the measures consisting of three pillars: (1) market stabilization, (2) growth enforcement and (3) comprehensive monetary easing. For the market stabilization, the BOJ instituted the policy measure to support the enterprise financing in December 2008, focusing on the credit provision to enterprises. Further the BOJ implemented the measure to enhance the growth base by employing the fixed-interest rate provision of fund in June 2010.

In October 2010, the Bank of Japan began the “comprehensive easing policy”; it put more emphasis on the credit easing aspect, as compared with the previous quantitative easing policy; it widened the scope of asset menu to include private bonds with lower ratings, the ETF and the J-REIT. In particular, the J-REIT dividend yield reacted sharply and the J-REIT index bottomed out immediately after the announcement of the BOJ purchase of J-REIT (Figure 2).

Within a framework of comprehensive easing policy the BOJ established a BOJ asset purchase fund, thereby abolishing the rule of ceiling on the amount of purchase of long-term government bonds. The size of fund was expanded three times from ¥35 trillion to ¥55 trillion in October 2011. The total purchase of long-term government bonds will increase to ¥30.6 trillion. Yet, the loss involved in the asset purchase was not indemnified by the MOF. It seems desirable to establish a separate entity from the BOJ balance sheet and widen the scope to expand the purchase of various assets including foreign bonds with collaboration with the MOF. One of the authors made proposal to establish the crisis prevention fund of ¥50 trillion for purchasing foreign bonds which is indemnified from loss by the MOF in a first meeting of the state strategy conference at the end of October 2011.

Furthermore, it is also reasonable to conduct the purchase of government bonds in a consistent manner with the debt management policy; it should be avoided to lengthen the maturity structure from the side of debt management policy, because it will prevent the long-term interest rates from lowering. In QE1 the debt management policy lengthened the maturity structure in issuing new bonds, while the maturity of the government bond held by the BOJ was shortened (Iwata (2010)).

The “comprehensive easing policy” also extended the time horizon of policy duration; the easing policy will be sustained, until the attainment of about one percent inflation rate is envisaged in the forecast horizon. We can interpret it as a sort of “forecast inflation targeting”. One of the authors found it appropriate to introduce that practice in October 2003 when the concept of policy duration was clarified.

In the second unconventional policy measures, the expansion of the size of the BOJ balance sheet was initially modest. But the ratio of the size of the BOJ balance sheet to nominal GDP increased more rapidly after October 2010. Yet, the level of BOJ's total assets remained lower than that of the first quantitative easing policy (Figure 1).

Turning to intervention policy, we observed four market interventions on August 2010 (amounting to ¥2.1 trillion), March 2011 (amounting to ¥700 billion in the “concerted intervention with the G7 countries), August 2011 (¥4.5 trillion) and October and November 2011 (amounting to about ¥10 trillion). The total amount of intervention was also modest, as compared with the great intervention policy in 2003-4.

What makes difference from the US dollar, the euro and the UK sterling is the fact that the nominal/real effective yen rate showed sustained upward trend with the bottom in 2007, despite the adoption of BOJ's expansionary monetary policy. This may be due to the smaller damage to Japanese financial institutions during the global financial crisis and the modest degree of monetary expansion, as compared with the US.

The IMF annual consultation report provided an assessment of QE 2; it reduced the 10 year bond rates by 25-50bp, while raising the stock price by 5-7% and J-REIT index by 14.3%. However, the effect on the yet rate was found to be ambiguous.

In spite of the adoption of the two unconventional policies, the deflationary trend persists; the CPI excluding energy and foods registers about 1% decline, while the overall CPI rate of change remains close to zero after the change of base year in August 2011.

Based on various empirical studies, the effects of the two unconventional policy measures in Japan can be summarized as below.

- (1) The liquidity and credit premiums narrowed significantly.
- (2) The spread of private bonds was reduced, reflecting smaller risk premiums. In a second round of unconventional policy measures, the impact on the J-REIT dividend yield was conspicuous.
- (3) The interest rates of longer maturity were lowered, mainly due to the policy duration effect; it was supplemented by quantitative easing policy in the first round of unconventional policy measures. In the second round measures, the lower long rates were realized mainly by the direct asset purchase, as the policy duration effect was not employed until the comprehensive easing policy was announced.
- (4) The equity price responded positively to the unconventional policy measures, while the impact on bank credit was limited, due to the balance sheet adjustments both by banks and non-financial firms in the process of deleveraging in QE 1 and weak demand in a stagnant economy for bank loans in QE 2.

(5) The impact on the exchange rate seems to be significant in the first QE, as the massive intervention policy was employed in a process of increasing the bank reserve target under the ZIRP (Watanabe and Yabu (2007)). The joint efforts succeeded to depreciate the nominal/real yen rate; this helped to bring about the gradual increase of core consumer price rate of changes to slightly above zero in early 2006. Yet, in a second round of unconventional policy measures, the effect on exchange rate was muted, because the Federal Reserve and other central banks implemented the much larger scale asset purchase program than that of the BOJ.

(6) The impact on aggregate demand was limited, primarily due to the fact that the expansion of BOJ's asset holdings or the monetary base expansion cannot be permanent under the commitment on the exit from QE; QE was conceived as a temporary measure until the financial intermediary function of financial institutions is restored. This problem is common to other central banks' balance sheet expansion. The BOJ has not yet succeeded in reversing the persistent deflationary expectation ^[3].

Federal Reserve

After the policy rate was reduced to its lower bound of essentially zero in December 2008, the Federal Reserve introduced the first large-scale asset purchase program(QE1) amounting to \$1.75 trillion in March 2009. It included the massive purchase of MBS (0.6 trillion), agency bonds and government bonds (0.3 trillion). The spreads between MBS and Treasuries were significantly reduced.

Before launching QE1, the Fed introduced the dollar swap line program with the ECB and the SNB in the face of disruption of dollar funding market including the euro/dollar FX swap market in December 2007. At the peak of the program, swaps outstanding totaled more than 580 billion, accounting for over 25% of the Fed's total assets in December 2008 (Flemming and Klagge (2010)) ^[4]. The swap arrangements proved to be effective in stabilizing financial market. At the same time it pointed to a need for international coordination to provide sufficient global liquidity when the origins of financial shocks were the centers of international reserve currencies. At the end-November 2011 the Federal Reserve slashed the penalty rate on dollar liquidity from 1% to 0.5% in swap arrangement with the ECB, the BOE, the BOJ, the BOC and the SNB in the face of global fear on the Euro's existential crisis.

The second large-scale purchase program was initiated in November 2010 and ended in July 2011. The second policy program focused on the purchase of government bonds amounting to \$0.6 trillion; namely, the Federal Reserve adopted the quantitative easing rather than the credit easing policy.

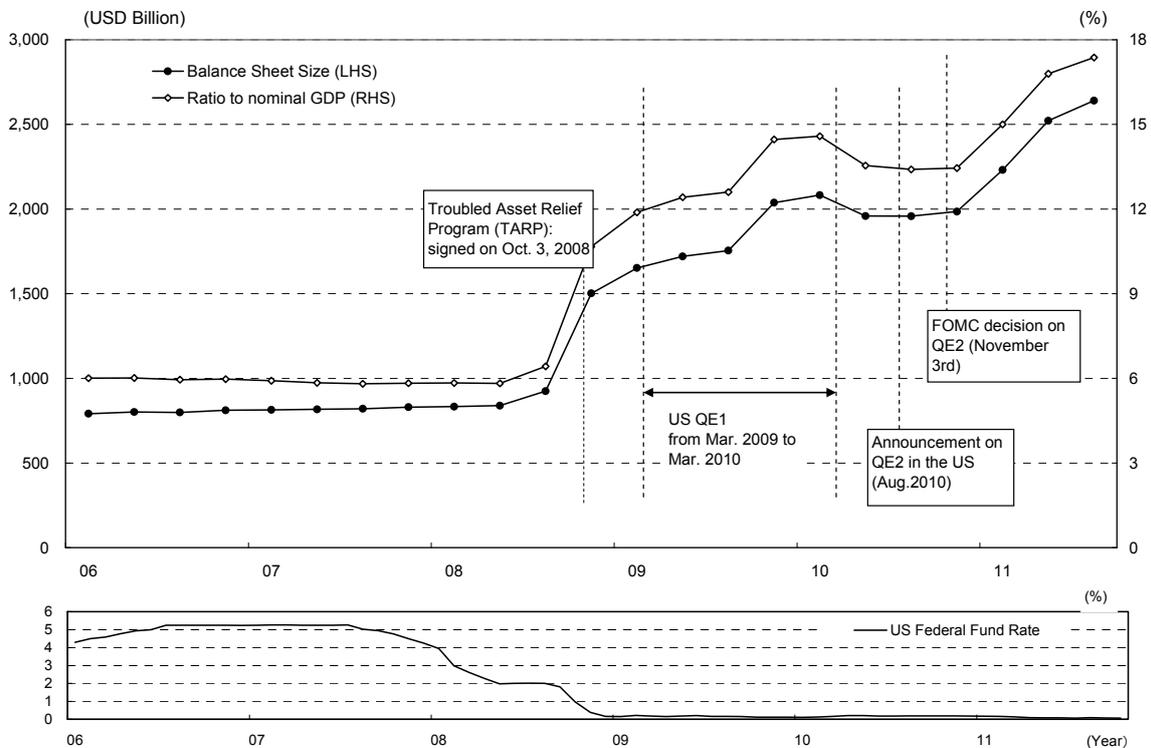
One of the differences from the Japan's quantitative easing policy was to focus on

the asset side of central bank balance sheet, while the BOJ set target on the liability side of central bank balance sheet; namely the size of sight deposit outstanding by financial institutions at the BOJ. The policy centering on asset side aimed at supporting the financial intermediary function through the asset purchase by central bank, while the policy focusing on liability side provided the buffer against the funding liquidity through the increase in private banks' excess reserve. The difference of unconventional policy measures between the Federal Reserve and the BOJ reflects in part the difference in financial structure (the market-based system vs. the banking-based system). The emergency liquidity was provided not only to commercial and investment banks but also to the shadow banking system.

Another difference is the inclusion of large-scale purchase of MBS, putting emphasis on credit easing aspect of unconventional policy measures. Third difference is the speed of expansion of central balance sheet. It took about one year to increase the size of its balance sheet from 20% to 30% (Figure 3), while the BOJ took five years to increase the ratio by 10%.

In August 2011, the Federal Reserve announced the extension of low interest rate through mid-2013, aiming at realizing lower long rates through the channel of market

Figure 3: Balance Sheet Size of the Federal Reserve



(Source) International Monetary Fund, *International Financial Statistics*; Bureau of Economic Analysis, *National Economic Accounts*

expectation on the policy duration. Mr. Evans, President of Chicago Federal Reserve Bank, urges to promote further clarification of the exit condition; monetary easing policy should be maintained, as long as the unemployment rate remains above 7.5 percent, given the dual mandate of the Federal Reserve.

In September 2011, the Fed employed the “Operation Twist” (the asset composition change policy) amounting to \$400 billion; the “Maturity Extension Program” was designed to change the composition of balance sheet and lengthen the maturity of the Fed’s holdings of government bonds from 75 months to 100 months. “Operation Twist” is expected to lower the long-term interest rate by 15bp whose effect is similar to QE 2 (Alon and Swanson (2011)).

After the announcement of the two policy measures; one to lower the interest rates with the maturity of one month to two and half years and the other to reduce the rates of longer than three years maturity, the decline of nominal long rates was accompanied by lower real bond yields which reached below 0%. The sharp reduction of long-term interest rates was in part due to the change in money flows from money market funds into the Treasury market, because the money market funds proved to be engaging in lending to European borrowers.

According to the IMF assessment on cumulative effects arising from QE1 and 2, it reduced the long-term interest rate by 105 bp. Gagnon et al estimated that ten year term-premium was reduced by 30-100bp. If the effect of agency bond and the MBS are included, the impact was much larger. The announcement of QE1 provided the real turning point for the market of CDS and equities of the US and emerging countries, thereby narrowing the spread of interest rates between the MBS and government bonds.

IMF study found that QE 1 and 2 pushed down the dollar rate by 5%. It is interesting to note that in IMF estimates, two programs worked to appreciate the yen rate by 12%. The estimates suggest that the US LSAP 1 and 2 dominated the yen rate movements; the yen/dollar displayed sharp appreciation after 2008, thereby swamping the effect of expansionary policy measures on the yen rate by the BOJ.

On the effect on aggregate demand and unemployment, San Francisco Federal Reserve Bank argued by employing the FRB/US model that the LSAP 2 will raise the real GDP by 3% and increase the inflation rate by 1% respectively, thereby reducing the unemployment by 1.5% (Chung et al. (2011)). The actual outcome was rather disappointing. The limited effect may be in part attributable to the newly-issued government bonds at a faster rate than the Fed’s purchase of bonds.

So far, the US seems to have escaped from falling into deflation. Although the expected inflation rates was raised by QE 2, it fell steeply as commodity prices started to decline; In September 2011 it stands at the same level as that in summer 2010 when

the QE 2 was announced.

Moreover, the US expansionary monetary policy was accompanied by the commodity price hike which fed back to the US economy, dampening the consumer spending. The US expansion slowed down since the beginning of 2011, in part due to the oil price hike ^[5]. The adverse international repercussion can undermine the welfare improvement of domestic economy through monetary expansion. We will return to this issue in Section VI.

ECB

In early-August 2007 the liquidity shock prompted the ECB to provide massive liquidity (amounting to €95billion) through main refinancing operations to the financial market in response to the first signs of the subprime seizure. Main part of liquidity was sterilized, as the widening Euribor-OIS spread subsided.

After the Lehman shock, the Euro-system's balance sheet expanded from €1.5 trillion to €2 trillion in mid-2008. As compared with other central banks, the expansion of its total assets remained relatively modest until mid-2009.

In October 2008 the ECB decided to change the procedure of the weekly main refinancing operations to a tender procedure with full allotment at a fixed rate. Mr. Trichet named it the "enhanced credit support". The enhanced credit policy worked to lower funding costs by banks of periphery countries such as Greece, Ireland and Portugal; the average costs was estimated to be reduced almost by 500bp, according to the IMF spillover study (2011).

However, the balance sheet expansion restarted in June 2009; the ECB began to purchase the covered bonds and continued the operation for one year. This asset purchase can be described as an "ambiguous quantitative easing policy" or "the non-standard monetary policy".

Facing the deepening fiscal crisis, the ECB began to purchase the government bonds issued by the governments of Greece, Ireland and Portugal in May 2010, in an attempt to remedy the malfunctioning of government bond market (the Securities Markets Program). In July 2011 it purchased the Italian and Spanish government bond. So far, total amount of purchase of government bond reached the level of about €183 billion at end-October.

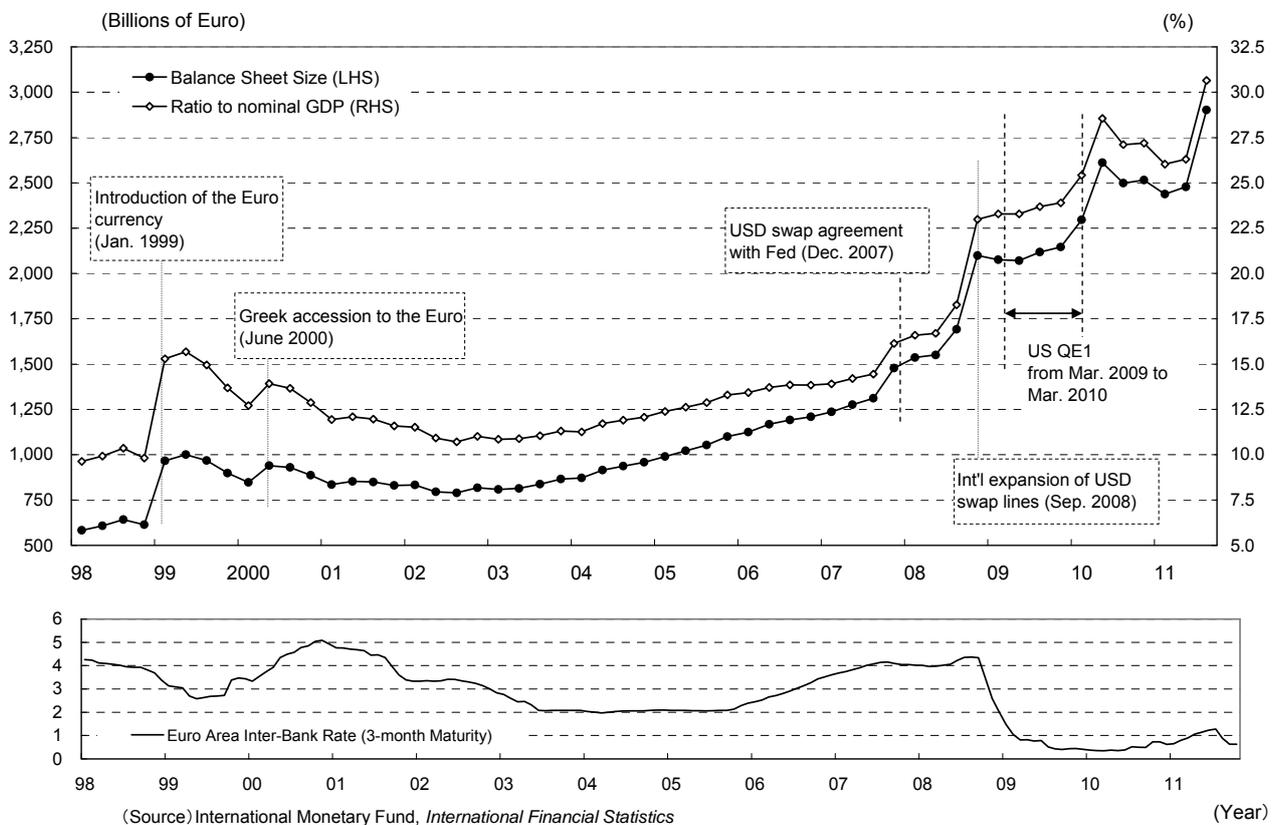
The Treaty of the European Union (Article 21.1) prohibits the ECB from directly buying bonds from EU governments, based on the premise that the ECB is not allowed to engage in deficit financing of the Euro member governments. The purchase of government bonds from secondary markets is not prohibited. But the potential loss will erode the ECB's capital base.

It is not the General Council of the ECB, but the European Council that can make decision on the increase of ECB's capital. The issue on indemnification will appear immediately, if the Euro member governments want to employ the ECB's securities markets program for the purpose of leveraging the European Financial Stability Facility. ECB attempted to persuade finance ministers to at least double the EFSF rescue fund and indemnify it against possible loss on its purchase of weaker euro member countries already in late 2010.

While it is uncertain how much the ECB will purchase the government bond over the future, the ECB decided to re-institute the purchase of covered bond in October 2011. The ratio of its total assets to nominal GDP increased by a similar size to those of other central banks from 15% in 2007 to 25% in 2011 (Figure 4).

The non-standard monetary policy seems to have exerted significant effect on bank lending rate, but it was not the case with respect to the effect on the amount of bank lending. The euro rate was affected by the interest rate differential between the US and the Euro area, while the effect on the euro rate by non-standard monetary policy seems to be ambiguous (Takaya (2011)).

Figure 4: Balance Sheet Size of Euro Area

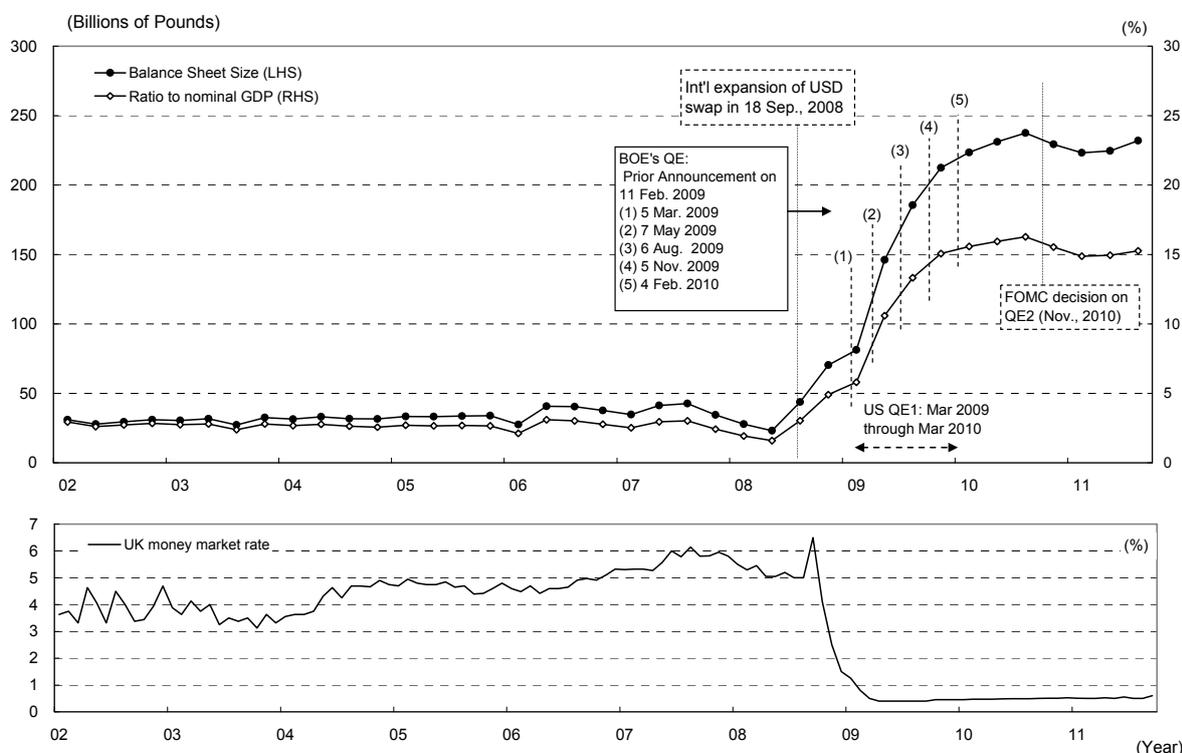


Bank of England

In January 2009, the Bank of England created a new fund, namely the “Asset Purchase Facility,” which initially purchased commercial papers funded by the proceeds of sales of short-term Treasury bills by the Debt Management Office. The policy measure can be classified as credit easing which was akin to fiscal operations. In March 2009 the BOE embarked on the quantitative easing policy; it announced to purchase £200 billion of long-term government bond which accounted for 14% of nominal GDP, exceeding the expected size of newly issued bond in 2009. In October 2011, the BOE expanded the asset purchase of £75 billion in view of weak domestic demand and the expected lower inflation rate than the target over the medium-term, despite the current high inflation rate of 4.5% in August.

The BOE asset purchase was conducted by a separate entity, namely the BOE Asset Purchase Facility Fund, a limited company. Both the BOE and the Fund are fully indemnified by the Treasury from any losses arising out of the asset purchase program. Furthermore, an agreement was concluded between the Chancellor of Exchequer and Governor King that the debt management policy would not alter its plan of gilt purchases because of the temptation to minimize the costs (Iwata (2009)).

Figure 5: Balance Sheet Size of Bank of England



(Source) International Monetary Fund, *International Financial Statistics*; Office for National Statistics, *United Kingdom Economic Accounts Q3 2011*.

Another difference from the BOJ's quantitative easing policy is that the BOE targeted on the asset purchase from non-bank private sector such as pension funds; it did not aim at expanding bank lending directly. The banking sector was in a process of deleveraging, facing the risk of capital shortage.

The BOE's total assets had already expanded prior to the launch of quantitative easing policy. The ratio of the balance sheet to nominal GDP increased from less than 5% in end-2008 to more than 15% in mid-2010 (Figure 5).

According to the BOE's empirical evidence based on the event study on the effect of QE 1, the long-term interest rate with 5-25 years segment was lowered by 50-120 bp mainly through a portfolio rebalancing effect, (Loice et al. (2010)). The size of the effect was similar to the case of the US QE I and II. Yet the impact on equity prices was muted, although the negative tail risk diminished considerably with the implied volatility falling about 40%. The inflation expectation over medium-term seems to remain stable, despite the sizable overshooting of inflation rate over the target. Moreover, the effect of QE 2 is expected to be larger than that of interest-rate cut of 0.75%.

The impact on the exchange rate was small; the event study suggests that the size of immediate response of sterling to the announcements on QE was estimated to bring about depreciation of 4%.

During the period from February 2009 to March 2010, sterling actually appreciated by 1%. The uncovered interest rate parity suggests 8% depreciation, if we take into account the reduction of ten-year spot yields over the QE announcement events.

Smaller impact on sterling may be attributed to the following two facts. First, prior to the introduction of the large scale asset purchase program, the nominal/ real sterling rate began to drop sharply in mid-2007. After bottoming out of exchange rate, the large scale asset purchase program was instituted.

Second, other advanced economies also adopted the expansionary monetary policy.

Third, Mr. Broadbent, the Member of the Monetary Policy Committee of the BOE, pointed out that the sustained expected depreciation of real five years forward sterling rate can be attributable to the changes in terms of trade and the relative price of non-traded to traded output (Broadbent (2011)).

In his view, market judged that credit crunch would hit hard the demand for non-tradables, as represented by weak residential investment and the anticipated reduction of public spending due to the vulnerability of the public finances. Moreover, its low supply elasticity arising from low degree of factor mobility added to the

expected decline of non-tradable prices.

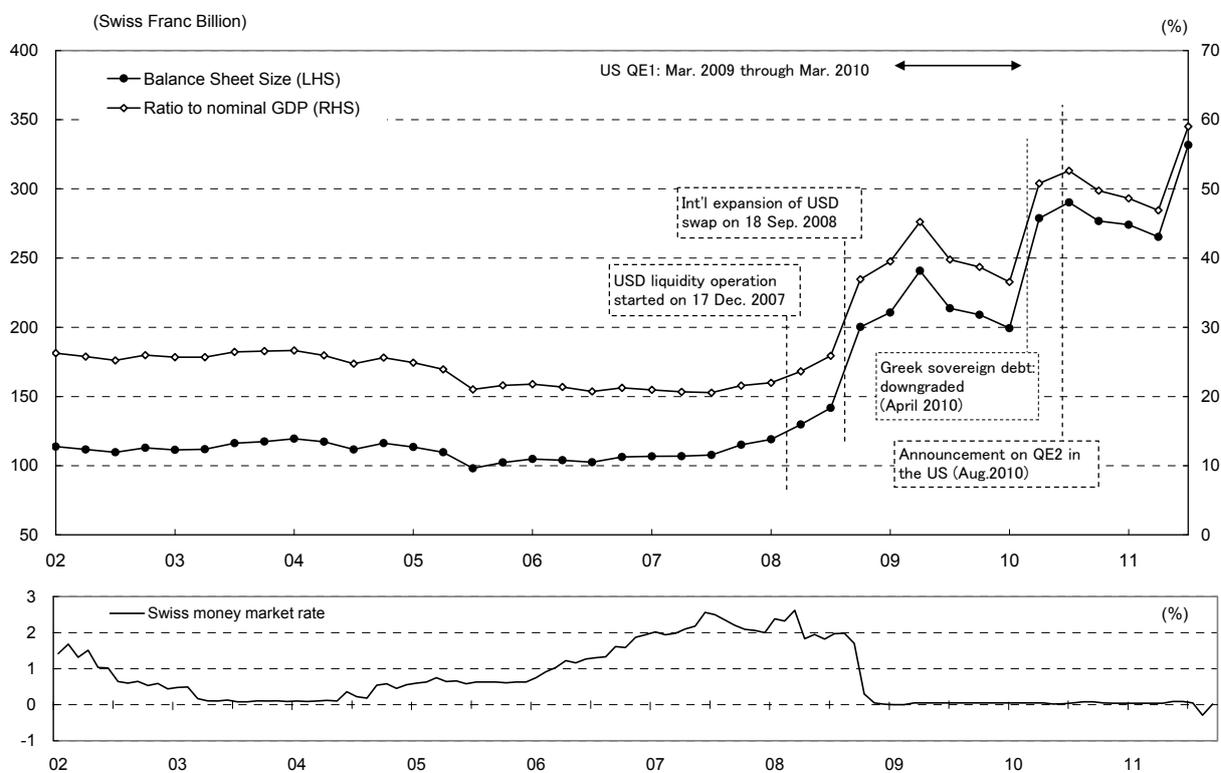
In other words, a sharp expected decline of expenditure on non-tradable sector brought about a sizable depreciation of real sterling rate. His insight is indeed illuminating. We return to this issue on the relation between the real exchange rate, the terms of trade and the relative price of non-traded to traded output in the section IV.

Swiss National Bank

The ratio of the SNB's balance sheet to nominal GDP showed sharp increase immediately after the Lehman's collapse; at the same time the second phase of international agreement on US dollar swap arrangement was invoked. Further, the SNB engaged in the intervention policy since spring 2009 with the aim of moving out from deflation and avoiding the excessive appreciation of Swiss franc.

The size of SNB's balance sheet relative to nominal GDP expanded rapidly from 25% in September 2008 to more than 50% in 2010 (Figure 6). When the ECB introduced its twelve month long term repo-operations in 2009, the SNB was obliged to intervene on the foreign exchange market. Then, euro-zone banks that cannot access

Figure6: Balance Sheet Size of Swiss National Bank



(Source) International Monetary Fund, *International Financial Statistics*; Swiss National Bank, *Monthly Statistical Bulletin* December 2011. (Year)

Swiss franc funding on the interbank markets to finance Swiss franc-denominated loans used the ECB's liquidity tenders and immediately sell the euro in the spot market. The Swiss franc is now a shadow currency such as the German mark prior to the introduction of the euro.

The Swiss economy fell into deflation in early-2009. But thanks to a massive intervention policy, deflation ended in October 2010. The achievement was accompanied by a large capital loss, which invited criticism. Yet in Japan we have accumulated even greater capital losses in the Foreign Exchange Account due to the sharp appreciation in the yen rate after 2008.

The Swiss central bank announced in August 2011 that the upper limit is set on the euro/Swiss franc rate; the Swiss franc was virtually pegged to the euro. No further appreciation would be tolerated beyond 1.2 franc to euro, though the lower limit was not set. This implied the unlimited intervention policy on the foreign exchange market. The ECB re-introduced its twelve month repo-operations. This would induce the upward pressures on the Swiss franc against the euro; it will prompt the SNB to intervene on the spot market. This will lead to further expansion of the SNB's balance sheet. Critics expressed a view that the unlimited intervention policy will invite the danger of the beggar-thy-neighbor effect and arouse the protectionist pressures in the trading partner countries. We will return this issue in Section VI.

Figure 7.1: Effective Exchange Rate (Japan)

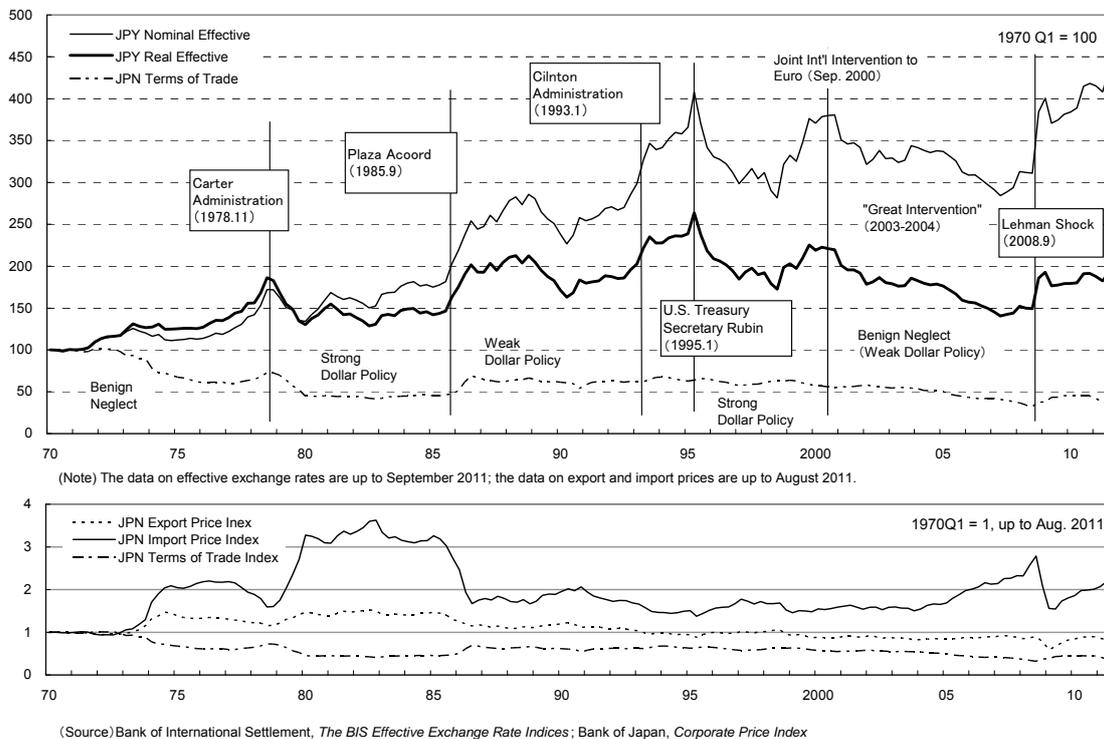


Figure 7.2: Recent Development in Terms of Trade (Japan)

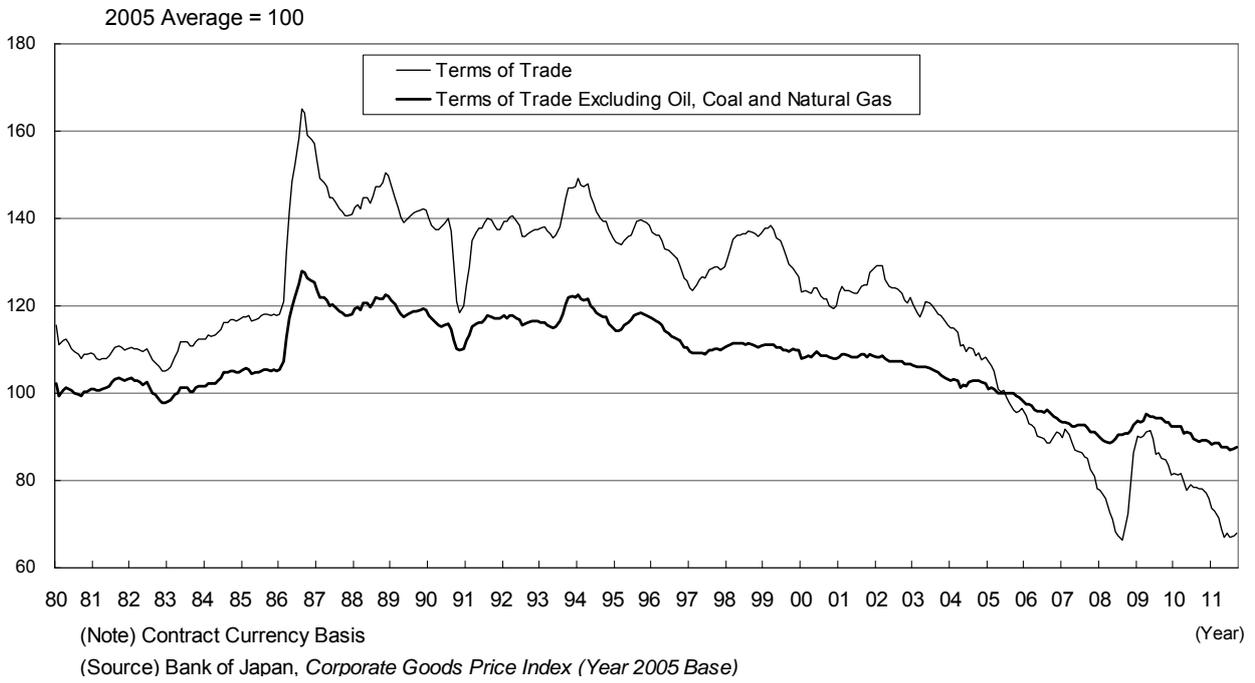
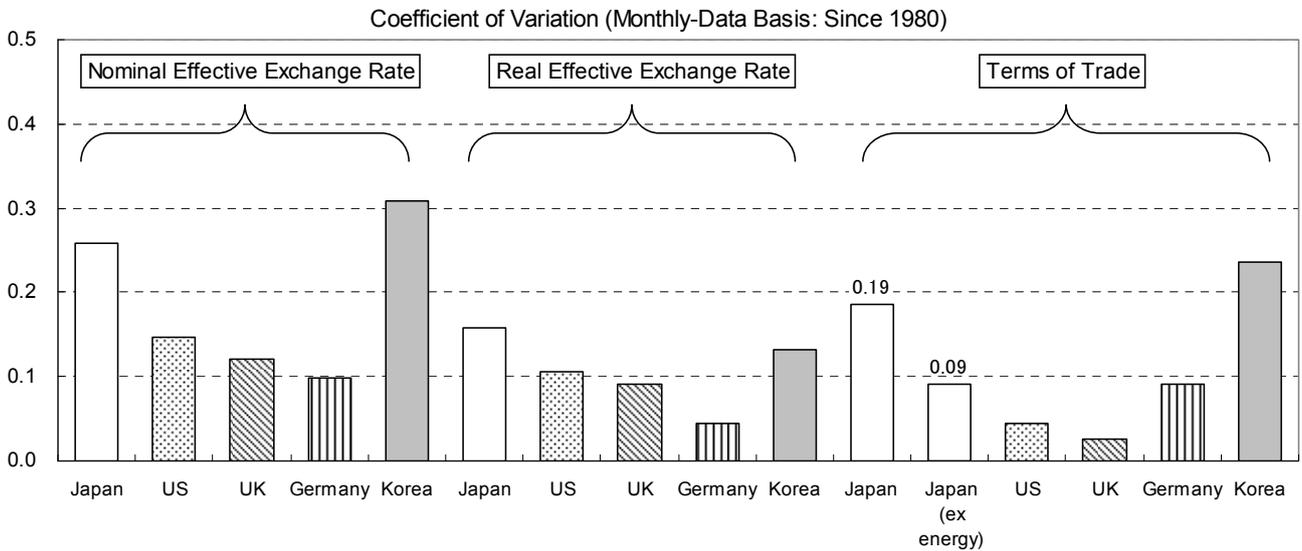


Figure 7.3: Effective Exchange Rate and Terms of Trade



III. Long-term Developments of Exchange Rates and the Terms of Trade

Long-term Development of Nominal/Real Effective Exchange Rates

In discussing the effect of unconventional monetary expansion, we examine the development of Japanese nominal/real exchange rate and the terms of trade from the long-term perspective, in comparison with those of other major countries.

The first remarkable fact is a sustained upward trend of nominal and real effective yen rate since 1970. With respect to nominal rates, the Japanese yen and the Swiss franc were on a strong upward trend (Figure 7.1, 8). The size of appreciation in the two economies is almost comparable; nominal rate is four times higher, while the real rate almost doubled. The difference between the two rates reflects the divergence of inflation rate between Japan and Switzerland, on one hand, and the other trading partner countries on the other.

The nominal effective rate of the German mark (the euro after 1999) followed the similar appreciation trend as Japan and Switzerland, yet with much smaller scale. In contrast, the real effective rate remained remarkably stable; it did not show any appreciation since 1970 (Figure 9). The nominal/effective euro rate moved in parallel with the German rate. But its size of appreciation is larger than the German rate (Figure 10).

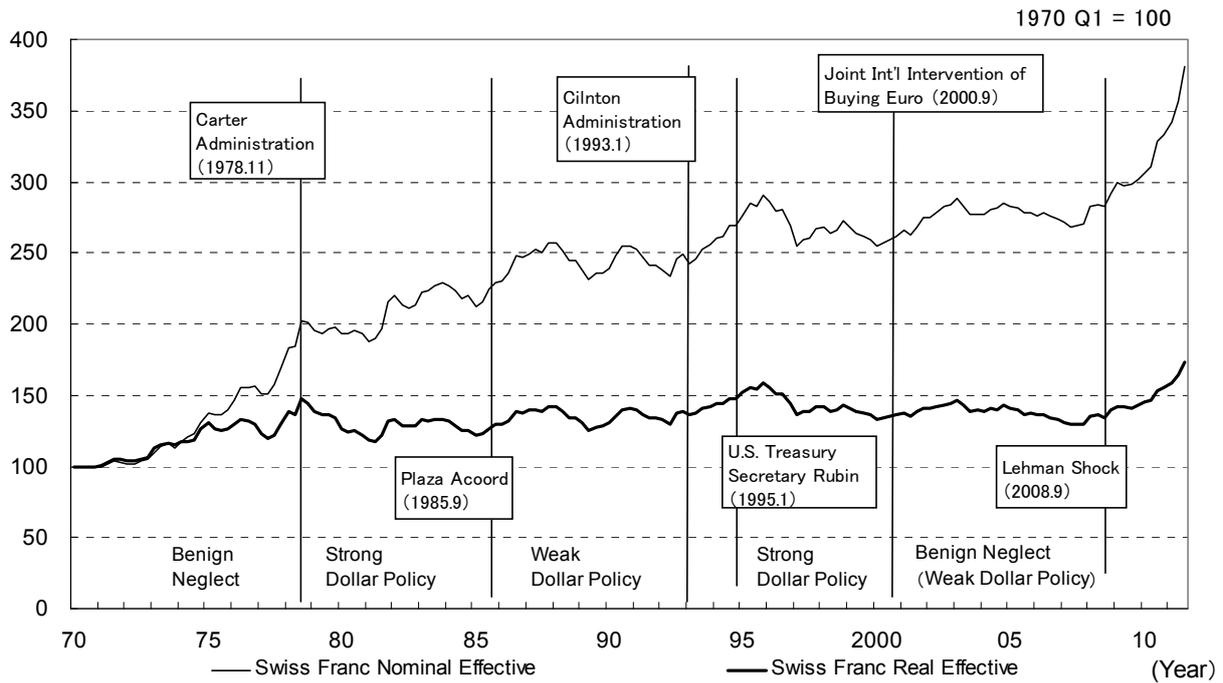
Germany benefited greatly from the introduction of the euro. After the introduction of the euro, the German real effective rate (employing unit labor cost as a denominator) depreciated by about 18%, while the real rates of periphery countries appreciated by about 7-10% (Table 1). The German firms' international competitiveness was substantially strengthened.

On the other hand, the US dollar tended to depreciate both in nominal and real terms; it has hit a new low in 2011. The divergence between the nominal and real effective rates was small, as compared with the pound sterling (Figure 11).

The nominal sterling rate depreciated deeply by about 100%. But the real effective rate depreciation was limited to about 25%, due to the higher inflation rate in the UK than the trading partner countries' (Figure 12).

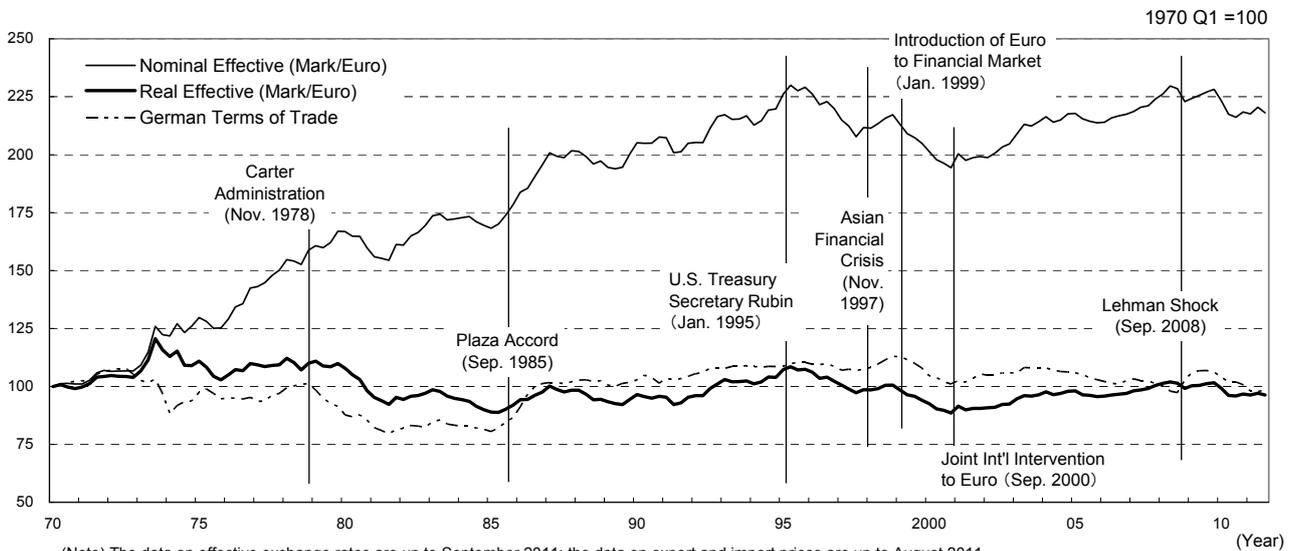
Turning to Asian economies, the size of depreciation of nominal Korean won rate (about 400%) was much larger than the sterling, though the real rate depreciation was limited to about 70% (Figure 13). Similar trends can be observed with respect to the Chinese yuan rate (Figure 14).

Figure 8: Effective Exchange Rate (Switzerland)

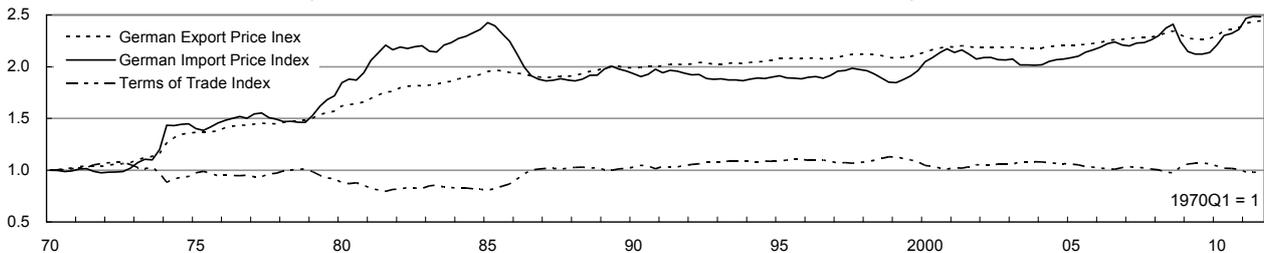


(Source) Bank of International Settlement, *The BIS Effective Exchange Rate Indices*

Figure 9: Effective Exchange Rate (Germany)



(Note) The data on effective exchange rates are up to September 2011; the data on export and import prices are up to August 2011.

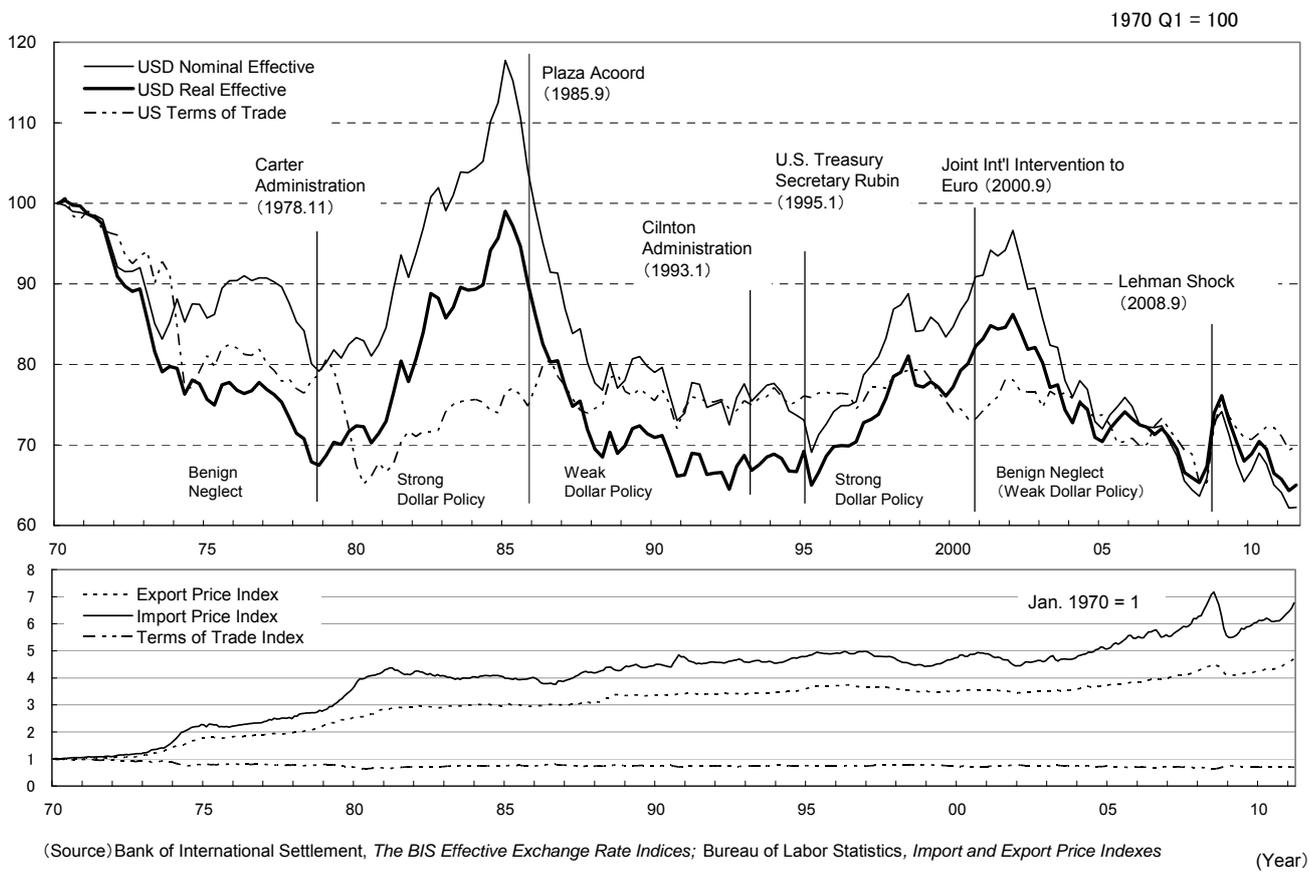


(Source) Bank of International Settlement, *The BIS Effective Exchange Rate Indices*; International Monetary Fund, *International Financial Statistics*

Figure 10: Effective Exchange Rate of Germany and Euro Area



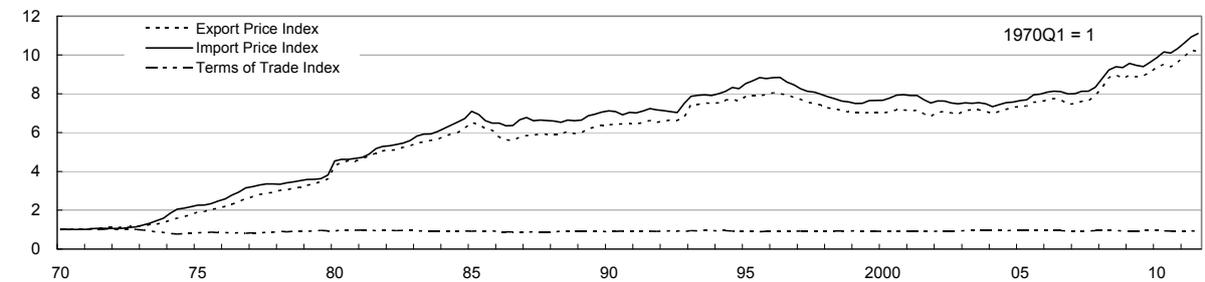
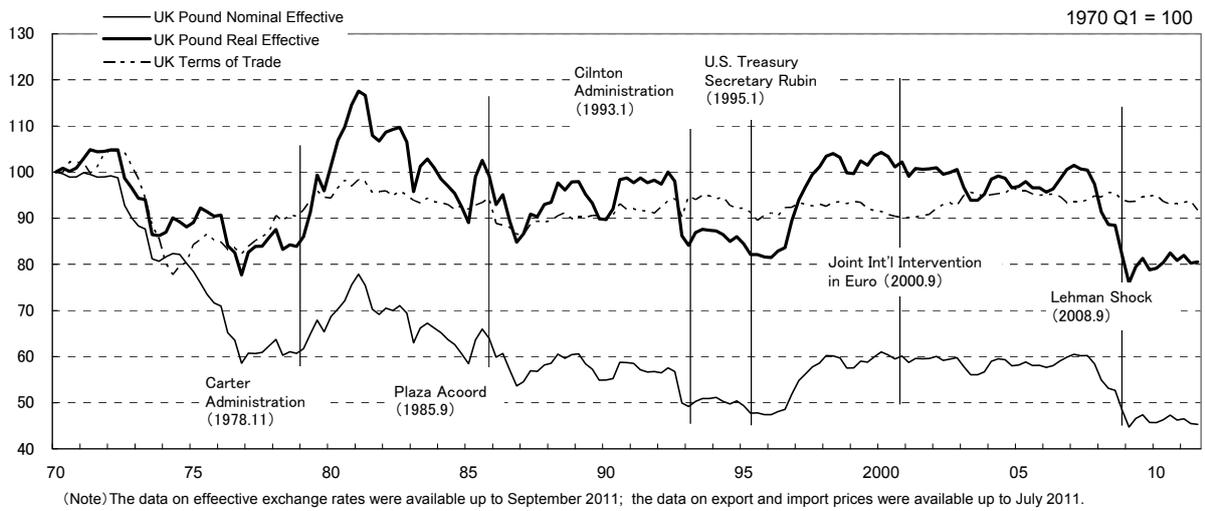
Figure 11: Effective Exchange Rate (US)



(Source) Bank of International Settlement, *The BIS Effective Exchange Rate Indices*; Bureau of Labor Statistics, *Import and Export Price Indexes*

(Year)

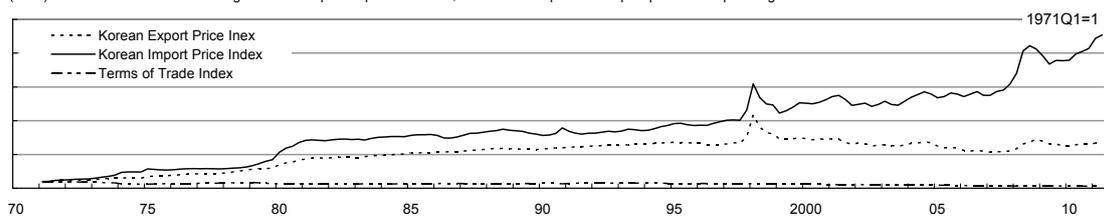
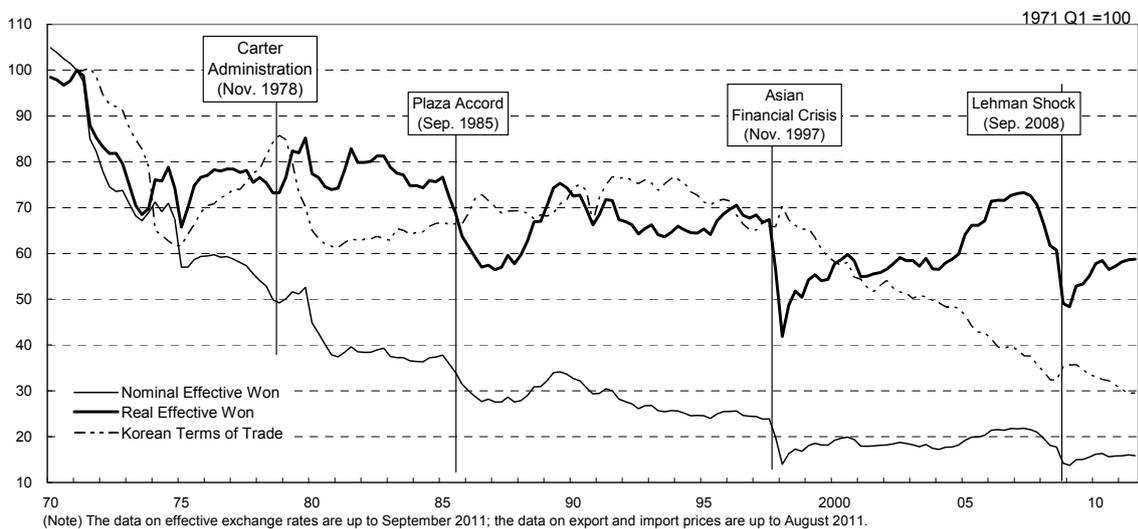
Figure 12: Effective Exchange Rate (UK)



(Source) Bank of International Settlement, *The BIS Effective Exchange Rate Indices*; International Monetary Fund, *International Financial Statistics*

(Year)

Figure 13: Effective Exchange Rate (Korea)



(Source) Bank of International Settlement, *The BIS Effective Exchange Rate Indices*; International Monetary Fund, *International Financial Statistics*

(Year)

Figure 14: Effective Exchange Rate (China)

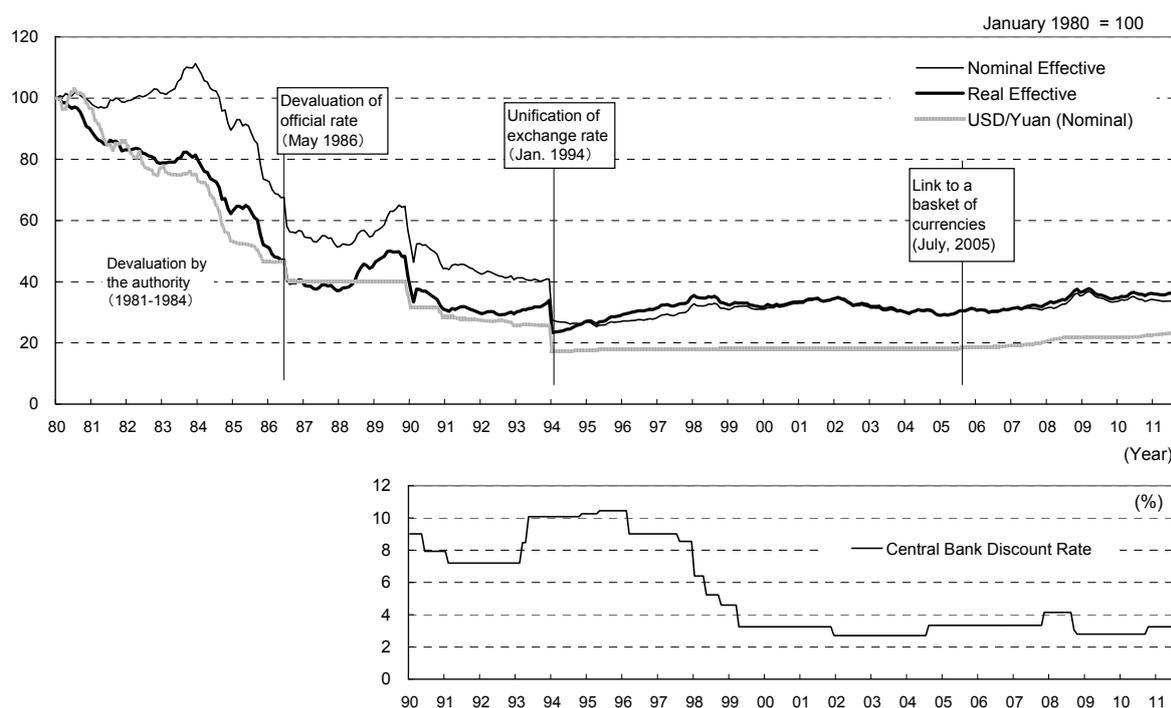


Table 1: Real Effective Exchange Rate in the Euro Area

(Percent change)

	Euro	Germany	Austria	Ireland	Greece	Spain	Italy
Real Effective Exchange Rate	0.2	-18.5	-8.7	6.5	9.7	7.4	6.6

(Note) Each of the above country's real effective exchange rate, except for the Euro, was derived through deflating the counterpart nominal rate by unit labor cost regarding the 20 countries; that of Euro, by the CPI indices. 99Q1=100.

(Source) European Central Bank

Table 2: Large-Scale Appreciation of Effective Exchange Rate and Contemporary Change in Terms of Trade

	Effective Exchange Rate	Terms of Trade	Effective Exchange Rate
1990Q2 -1995Q2	+45% (Nominal) +38% (Real)	-1.9% (Total) +1.1% (excluding Oil, Coal and Natural Gas)	
2007Q2 -2011Q3	+34% (Nominal) +27% (Real)	-27.5% (Total) -6.0% (excluding Oil, Coal and Natural Gas)	+30% (Nominal) +25% (Real)

(Source) Bank for International Settlements; Bank of Japan

Table 3: Large-Scale Depreciation of Effective Exchange Rate and Contemporary Change in Terms of Trade

	US		Euro	Germany		UK	
	Exchange Rate	Terms of Trade	Exchange Rate	Exchange Rate	Terms of Trade	Exchange Rate	Terms of Trade
1970Q1 -1973Q3	-20% -26%	-7.8%					
1985Q1 -1988Q2	-53% -45%	-2.2%					
1990Q4 -1996Q1						-24% -21%	-0.9%
2002Q1 -2011Q3	-55% -33%	-12%				-33% -26%	+0.1%
2007Q1 -2011Q3							
2009Q3 -2011Q3			-7.1% -9.5%	-4.3% -6.4%	-8.7%		

(Source) Bank for International Settlements; International Monetary Fund

The second marked feature is a sharp appreciation of nominal/real effective yen rates after the bubble burst, which peaked in 1995. Obstfeld (2011) noted;

“In Japan’s economic history after the bubble burst, the yen’s strong nominal/real appreciation in 1990-95 stands out as a pivotal episode”

It is indeed rare that a nation after a huge bubble burst experienced such an ever-rising value of its currency in both nominal and real terms (the “yen appreciation syndrome”). The nominal effective yen rate appreciated by 45%, while the real effective rate revalued by 38% in the period from second quarter 1990 to the second quarter 1995. In spite of the sharp appreciation of real effective yen rate, the terms of trade deteriorated by 1.9%. But if we exclude the energy price from the import price, the terms of trade improved marginally by 0.1% (Table 3).

For instance, after the Lehman’s collapse, the US dollar continued to slide down from the peak in 2002 reaching the lowest value in 2011. The nominal effective dollar rate depreciated by 55%, while the real effective rate devalued by 33% (Table 3). This large size depreciation is only comparable to that after the Plaza accord: the nominal effective dollar rate depreciated by 53% with the real effective rate being devalued by

45%. What makes difference between the two episodes of large size dollar depreciation is the size of deterioration of the US terms of trade. This time around, it worsened by 12%, while in the former case the size of deterioration was only by 2.2%. It has implication for the consequence of international repercussion of US expansionary monetary policy in Section VI.

It is interesting to note that Reinhardt and Rogoff (2008) identified the dollar crash in years of 1969, 1971 and 1975. The currency crash is defined as a sharp decline of exchange rate of more than 15% within a year. At the time of delinking of dollar to gold in August 1971, the size of depreciation of nominal effective dollar rate was only 20% in the period from the first quarter 1970 to the third quarter 1973 (Table 3).

Finally, the nominal effective euro rate declined from the peak in the third quarter 2009 by 7.1%, though with much smaller margin than other major currencies.

The third feature is related to the quantitative easing policy. Both the nominal and real effective yen rate depreciated as a trend during the period of the first quantitative easing policy from March 2001 to March 2006. Empirical study by Watanabe and Yabu (2009) indicated that the increase in bank reserve target combined with the massive intervention policy during the period from spring 2003 to spring 2004 exerted a significant impact on the nominal/real yen rate, in contrast to conventional sterilized intervention policy.

The fourth development of the yen rate markedly different from other major currencies was an extra-ordinary surge with the bottom in 2007, despite the ample liquidity provision and the subsequent adoption of comprehensive easing policy by the BOJ.

After the Lehman's collapse Yen and Swiss franc have been chosen as a safe haven currency. The nominal effective yen rate appreciated by 34%, while the real effective rate revalued by 27% in the period from the second quarter 2007 to the third quarter 2011. It is important to note that the Japan's terms of trade deteriorated sizably by 27.5%. If we exclude the energy price from the import price, it worsened by 6% (Table 2). The size of appreciation of the Japanese yen was larger than that of the Swiss franc in the same period.

Long-term Development of the Terms of Trade

With respect to the terms of trade development, we can identify several features as below;

First, the Japanese terms of trade showed a long-term decline over 1970 to 2011, in contrast to the movements of effective nominal/real yen rate (Figure 7.1). One of the primary factors to worsen the terms of trade was the rising trend of energy prices. The

Japan's terms of trade deteriorated markedly during the course of two time oil price hike in 1973-74 and 1979-80, in addition to sharp rising trend from the mid-2000s to 2008.

Second, we also observe that both the real effective yen rate and the Japan's terms of trade respond to shocks to the nominal yen rate in the same direction.

On the other hand, the US terms of trade co-moved with the real effective dollar rate except for the period of the first half of 1980s when the real effective dollar rate deviated markedly from the terms of trade; at that time, the protectionist pressures mounted and it led to the conclusion of the Plaza Accord in 1985 to avoid excessive overshooting of dollar rate. However, the size of overshooting and upward deviation of real dollar rate was much smaller than the case of Japan after 1985 (Figure 11).

It is remarkable that both the UK and German terms of trade remained stable over the long-term despite the fluctuation of real effective exchange rates.

Third, the Japan's terms of trade continued to worsen during the periods of implementing QE1 and 2, although it showed a small improvement caused by the sharp decline of oil price in July 2008. The real effective yen rate declined as a trend during the period of QE1, while in QE 2 the sharp real effective yen rate appreciation was accompanied by the worsening terms of trade. This worked to reduce the profit margin of Japanese firms, as discussed in the next section.

In the case of UK, in the period from the mid-2007 to 2009, the size of nominal sterling depreciation was about 40% (Figure 12). The QE1 was adopted after the sharp fall of the nominal effective rate. The depreciation of effective exchange rate was accompanied by higher imports prices which pushed up significantly the consumer prices. The depreciation may enhance the international competitiveness by lowering the UK export prices on the international market. However, it is remarkable that the terms of trade have remained virtually stable since 1980. The rise of import prices have been almost completely offset by higher export prices.

MacCoille et al. (2010) explained the stable development of the UK terms of trade by the pricing strategies adopted by UK exporters and trading partners who export to the UK. According to their investigation, the equal proportions of UK exporting companies pricing in foreign currency (LCP) and foreign exporting companies in their own domestic currency (PCP) led to the increase of both sterling export and import prices which broadly corresponded to the exchange rate depreciation. The asymmetry of pricing behavior of exporters of the UK and the Euro area brought about unchanged terms of trade in the face of exchange rate changes.

We elaborate the issue of exchange rate pass-through and choice of invoice currency in relation to the terms of trade changes in Section V. Before discussing the choice of invoice currency, we will examine the relationship between exchanges rates

and the terms of trade in the next section.

IV. Relationship between Exchange Rates and the Terms of Trade

Nominal exchange rate is responsive to asset market shocks including changes in monetary policy. On the other hand, the terms of trade is affected by exogenous productivity shocks and the changes in international commodity prices that are determined exogenously to individual countries.

The response of the terms of trade to exchange rate changes depends on a number of factors.

First, the response of the terms of trade to exchange rate changes will initially depends on the currency in which domestic and foreign companies set their prices under the assumption of nominal price rigidity. Firms may also have agreed fixed-price contracts. The menu costs could be non-negligible.

Second, over time, firms will be able to change their prices, depending on the timing of renegotiation of fixed price contracts. Prices will reflect the changes of the marginal cost and markups of price over marginal costs in response to exchange rate changes. The relative responsiveness of demand and supply elasticity and the market structure affect the outcome on prices.

Third, it is conventional wisdom that the depreciation of nominal/real exchange rate is accompanied by worsening terms of trade through the rise of import prices.

But this may not be always the case. Under the conditions of flexible prices with the existence of non-tradable goods, non-existence of home bias with respect to tradable goods in trading nations will make the movement of terms of trade independent from changes in real exchange rate changes completely.

Okada and Hamada (2010) pointed out that the real exchange rate can diverge from the terms of trade due to the two factors; namely,

- (1) the degree of home bias with respect to the tradable good produced by home country, and
- (2) the international “difference in differences” of relative price of non-tradable goods to tradable goods between economies.

With the aim of demonstrating the above two points, we follow the procedure taken by Okada and Hamada (2010) and Obstfeld (2011).

The overall price index is defined as the weighted sum of the tradable goods (P_T), composed of good 1 (export good) and good 2 (import good), and the non-tradable goods (P_N). The price index of tradables is the weighted average of the two tradable goods (P_1, P_2) as follows:

$$P = P_T^{\theta_T} \cdot P_N^{\theta_N}, \quad P^* = P_T^{*\theta_T} \cdot P_N^{*\theta_N};$$

$$P_T = P_1^{\delta_1} \cdot P_2^{\delta_2}, \quad P_T^* = P_1^{*\delta_1} \cdot P_2^{*\delta_2}.$$

Then, the real exchange rate = $E P^*/P$

$$= E \cdot \left[\left(P_1^{*\delta_1} \cdot P_2^{*\delta_2} \right)^{\theta_T} \left(P_N^* \right)^{\theta_N} \right] / \left[\left(P_1^{\delta_1} \cdot P_2^{\delta_2} \right)^{\theta_T} \left(P_N \right)^{\theta_N} \right]$$

$$= E \cdot \left[P_1^*/P_1 \right] \cdot \left[\left(P_1/P_2 \right)^{\delta_2 \theta_T} / \left(P_1^*/P_2^* \right)^{\delta_2^* \theta_T} \right] \cdot \left[\left(P_N^*/P_1^* \right)^{\theta_N} / \left(P_N/P_1 \right)^{\theta_N} \right]$$

$$= E \cdot \left[P_1^*/P_1 \right] \cdot \left[\left(P_1/P_2 \right)^{\delta_2} / \left(P_1^*/P_2^* \right)^{\delta_2^*} \right] \cdot \left[\left(P_N^*/P_1^* \right)^{\theta_N} / \left(P_N/P_1 \right)^{\theta_N} \right]$$

If we express the real exchange rate in logarithm (in small letters), then

Real exchange rate

$$= (e + p_1^* - p_1) + [\delta_2 \theta_T (p_1 - p_2) - \delta_2^* \theta_T^* (p_1^* - p_2^*)] + [\theta_N^* (p_N^* - p_1^*) - \theta_N (p_N - p_1)]$$

As already pointed out by Mr. Broadbend, the real exchanges rate is affected by terms of trade changes and the relative price of non-traded output to tradables. The first term describes the “head-to-head competition” effect among exporting firms. The second term represents the “overall terms of trade” effect, while the third indicates the modified “Harrod-Balassa-Samuelson” effect; we employ the word “modified,” because the third term includes relative price of non-tradables to the price of tradable good 1 only, instead of the price index of two tradable goods.

Based on the above equation, Obstfeld argues that “a rise of import price pushes up Japan’s tradable price level and causes the real appreciation of the yen” (smaller value). This may not be necessarily true. The assumed opposite movements of the terms of trade and the real effective exchange rate are, however, contrary to the experience in Japan, except for 2007 and 2008. Our conjecture is somewhat different from him, as explained below.

Let us assume that the prices are flexible; namely, the “law of one price” holds with respect to the two tradable goods so that

$$P_1 = E \cdot P_1^*, \quad P_2 = E \cdot P_2^*.$$

Then the real exchange rate can be greatly simplified into the following:

$$EP^*/P = \left(P_1/P_2 \right)^{(\delta_2 - \delta_2^*)} \left[\left(P_N^*/P_T^* \right)^{\theta_N^*} / \left(P_N/P_T \right)^{\theta_N} \right].$$

In logarithmic form,

$$\text{Real exchange rate} = (\delta_2 - \delta_2^*) (p_1 - p_2) - [\theta_N (p_N - p_T) - \theta_N^* (p_N^* - p_T^*)]$$

This result was obtained by Okada and Hamada (2010). The first term represents the terms of trade multiplied by the difference in weights attached to the tradable good 2 in home and foreign country. If there is a home bias with respect to the tradable good produced by foreign country, then it implies that $\delta_2 < \delta_2^*$.

As a result, the real exchange rate appreciation will be associated positively with the terms of trade. Yet, the size of movement of terms of trade will be much larger than the real exchange rate changes, as the size of home bias is smaller than one by definition. In reality, the more stable development of terms of trade than the real exchange rate can be observed with respect to the countries under observation (the US and the UK: Figure 7.3).

In addition, the positive association may be mitigated by the difference of relative price differential of non-tradable goods to tradable goods between the two countries. If the relative price of the non-tradable goods to the tradable goods higher in home country, as compared with the relative price in foreign country, the positive association will diminish.

Furthermore, if the purchasing power parity holds with the home bias remaining in tradable goods, then the real exchange rate remains constant at one. Because the purchasing power parity can be defined as below;

$$PPP = P/P^*$$

Then, the terms of trade is determined entirely by the differential of relative price between tradable and non-tradable goods.

$$\text{Terms of trade} = (p_1 - p_2) = [\theta_N (p_N - p_T) - \theta_N^* (p_N^* - p_T^*)] / (\delta_2 - \delta_2^*)$$

The productivity in tradable goods, higher than that of non-tradables in domestic economy, pushes up the relative price of non-tradable goods to that of tradables; in addition, it tends to worsen the terms of trade. In reality, the trend deterioration of terms of trade in Japan is often attributed to the productivity differential between tradable and non-tradable sector. On the other hand, the positive productivity shock to tradable sector abroad works to improve the terms of trade in domestic economy.

Harrod-Balassa-Samuelson Effect

If there is no home bias, namely, the consumers in the two country have identical preference, $\delta_2 = \delta_2^*$, then the real exchange rate is completely independent from the movement in the terms of trade. In this case, the real exchange rate is determined solely by the difference of relative price of the non-tradable good to the tradable goods between the two countries.

As the price differential between the tradable goods and the non-tradable good may reflect the labor productivity differential between the two sectors, larger labor productivity differential in home country implies the appreciation of real exchange rate of home country ^[6].

Japan's labor productivity in the tradable sector is much more rapid than the non-tradable sector. As a result, the productivity differential between tradable and non-tradable sector is larger in Japan than the US. Thus, there is a tendency that Japan's real exchange rate appreciates vis-à-vis the US (Harrod-Balassa-Samuelson effect). The terms of trade tends to worsen, if the purchasing power parity holds true.

To his surprise, Obstfeld (2011) could not detect any empirical evidence of short-run correlation between relative productivity changes and the yen real rate vis-à-vis the US dollar. In reality, the real exchange rates show much more volatile movements, as compared with the relative productivity changes in the two economies. He pointed out that only over 1995-2004, the Harrod-Balassa-Samuelson model got the right direction, when the Japan's relative productivity growth rate became smaller than that of the US ^[7].

Role of Oil Price Changes

In Japan, the divergence between the real exchange rate and the terms of trade is conspicuously larger than that of other countries like the UK and Germany.

In addition the secular decline of terms of trade is remarkable. This may be due to the heavy dependence on oil import in energy supply. The rise of oil import price may lower the relative price of non-tradable goods and thus induces the real depreciation, as the energy input share may be larger in tradable sector. The secular deterioration of terms of trade during the period from 1970 to 2010 can be attributed at least partially to the oil and foods price hike. The oil and commodity prices denominated in dollar are determined on the international market.

Moreover, the real oil price and the real effective yen rate display a high negative correlation. The oil price rise affects not only the terms of trade, but also the real effective exchange rate simultaneously. The Japanese import price has strongly correlated with the movement of oil price.

Obstfeld (2011) found that the Japan's terms of trade declined by more than 54% between 1988 and 2007, while the decline in the ex-energy terms of trade was much modest, at only about 18%. The ex-energy terms of trade has shown more stable developments than the overall terms of trade (Figure 7.2, 7.3).

It is true that the energy price rise contributed significantly to the deterioration of Japan's terms of trade. But, given the existence of home bias with respect to tradable

goods, there remains a puzzle why the terms of trade has worsened despite the strong rising trend of Japan's real effective exchange rate over the long run,

It is characteristic that Japan's export price did not respond to higher oil price. Moreover, the export prices show very stable movements despite the strong rising trend of nominal and real effective exchange rate. This suggests that the Japanese firms resisted the appreciation by squeezing the profits and cutting the markup ratio over marginal costs. This suggests that the Japanese exporters adopt the strategy of the "pricing-to-market" or the "non-pass-through" of exchange rate changes to export prices.

Mark-ups and Deflation

If the real effective exchange rate appreciates sharply and deviates from the fundamental rate, it will compress the mark-ups under the circumstance of monopolistic competition and erode the international competitiveness of exporting firms.

If the production costs can be represented by average costs, then the international competitiveness can be described as below;

$$\phi = (P/W_c)/(P^*/W_c^*) = (P/P^*)/(W_c^*/W_c)$$

Fukao and Dekle (2011) focused on the estimation of average costs of high productivity manufacturing, low productivity manufacturing and services sector between the US and Japan during the period from 1980 to 2005. After the Plaza Accord, the ratio of the US average costs to Japanese average costs declined sharply.

They derived the long-run equilibrium dollar-yen rate (benchmark PPP) based on the estimated average costs. Actual exchange rate showed wide overshooting from their putative equilibrium values in the period from 1985 to 1995.

An attempt to overcome the erosion of the international competitiveness of Japanese firms through cutting wages and increasing the share of non-regular workers was one of the major factors which brought the Japanese economy into persistent deflation and depressed level of investment including software. It is symbolic that nominal wages began to register the negative rate of change as a trend since 1997.

We conjectured that Japan entered the era of deflationary equilibrium after 1995; the GDP deflator showed negative rate of change in end-1994. The CPI deflation started after the re-appreciation in mid-1998 when the Asian crisis required the yen appreciation through the joint US-Japan intervention.

According to the Dekle-Fukao model estimates, the real exchange rate returned to the equilibrium level in 2003 when the nominal yen-dollar exchange rate was around 120 yen/dollar. This was exactly the rate at which the Ministry of Finance initiated the "Great Intervention Policy" in spring 2003. Thanks to the intervention policy under

implicit agreement between the Japanese and the US authority, nominal yen/dollar rate remained around ¥110-120. However, the findings diverge significantly from those by Jorgenson and Nomura (2007) who provided empirical evidence based on the PPP in terms of GDP that the overvaluation reached 78%, 41% and 24% in 1995, 2000 and 2004 respectively.

International Competitiveness

If the consumer prices can represent the movements of wage costs and the “law of one price” holds, then the international competitiveness can be measured by the difference between the terms of trade and the real exchange rate.

$$\phi = (P_1/P)/(P_2^*/P^*) = (P_1/P_2)(EP^*/P)$$

Then, we can see that the international competitiveness will be eroded, if the appreciation of real exchange rate exceeds the size of improvement of terms of trade. In other words, if the real effective appreciation is not accompanied by the improvement of the terms of trade it will create harder competitive conditions for Japanese industries. On the other hand, if the real effective exchange rate remains at one, then the international competitiveness can be measured by changes in the terms of trade.

Actually we observe that the US real effective exchange rate exceeded the terms of trade improvement in the first half of 1980s (Figure 11). The excessive dollar appreciation led to the Plaza Accord in 1985, although the size of appreciation of real effective dollar rate was comparatively small (about 20%), as compared with the appreciation of real effective Yen rate in the mid-1990s (about 100%).

The international competitiveness of Japanese firms has been eroded by the trend of ever-rising Yen rate which peaked in 1995. The share of Japan’s export on world market declined from 10% in 1993 to 5% in 2010, although the size of Japan’s GDP in world economy remains at about 9% (Figure 15).

It is debatable whether the current appreciation of nominal/real effective exchange rate since 2007 is excessive or not. The current level of real effective exchange rate is close to the level in 2003 which is lower than that in 1995. However, according to estimates by Jorgenson and Nomura (2007) the equilibrium yen rate is ¥134 in 2004. In addition, it must be noted that the terms of trade continues to worsen in recent years, diverging significantly from the real effective exchange rate.

Figure 16 shows that the current real yen/dollar rate employing the wage costs differential between Japan and US by industry as a denominator. The degree of real appreciation has been higher in the case of main leading industries such as electrical equipment and transportation machinery, as compared with that of 1995. Figure 17 presents the Balassa’s revealed comparative advantage by industry; the general

Figure 15: Export Shares of Japan and Germany



(Note) The values are measured in the US dollars.
 (Source) International Monetary Fund, *Direction of Trade Statistics*.

Figure 16: Real Yen/Dollar Exchange Rate by Industry

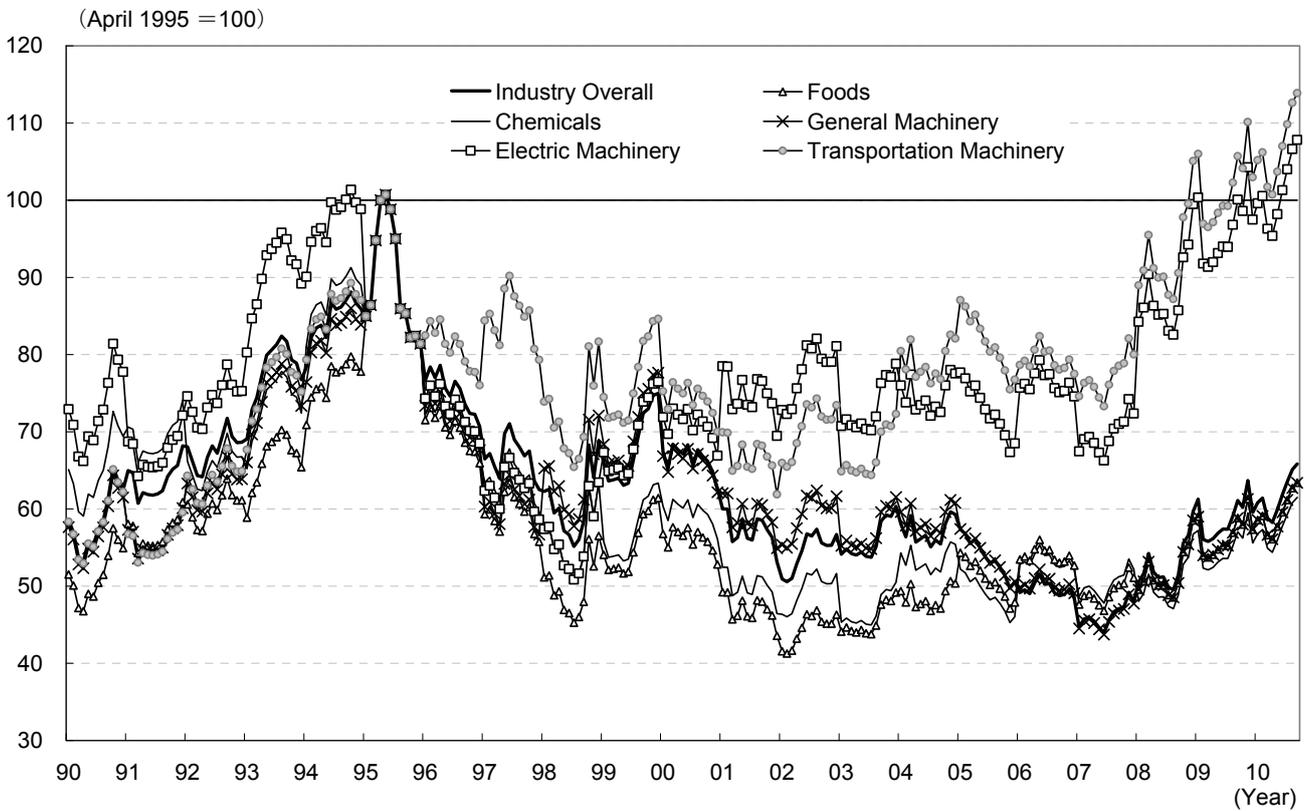
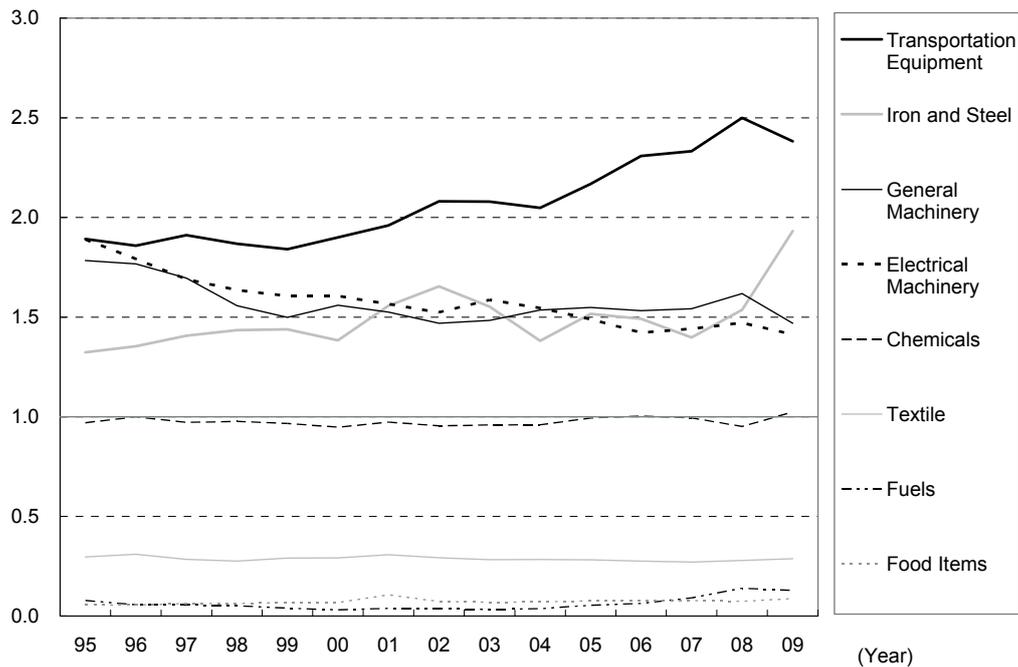


Figure 17: Revealed Comparative Advantage of Japan



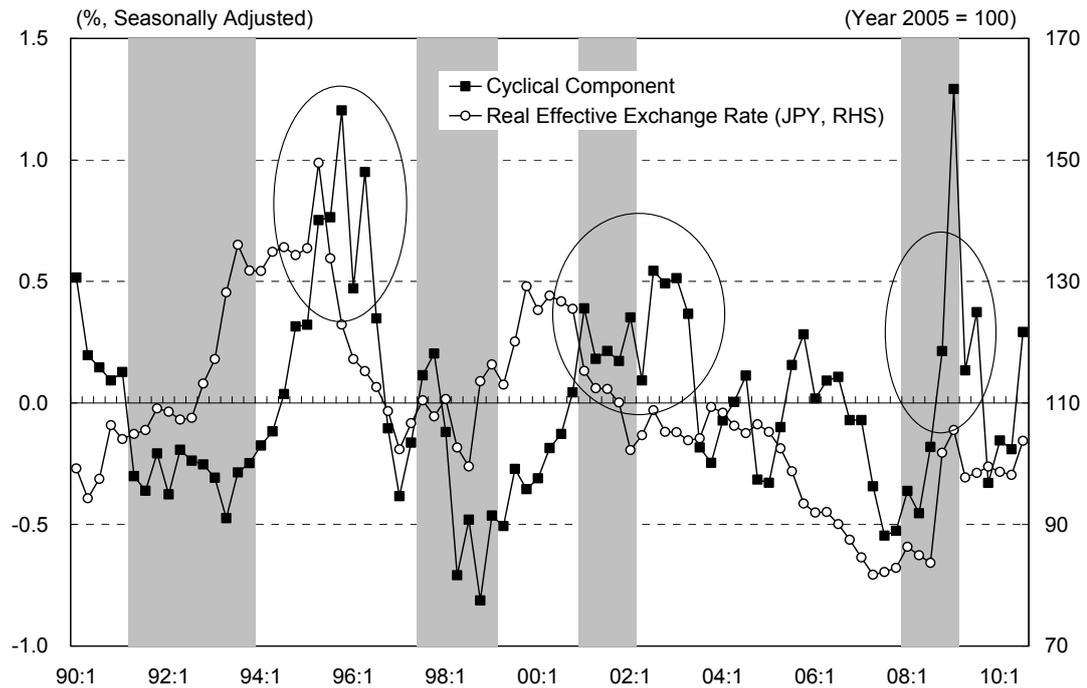
(Note) Balassa's Revealed Comparative Advantage Index is defined by the following ratio: (Japan's export amount of good *i* / Japan's total export amounts) / (World export of good *i* / Total world export). The index exceeding unity thus means the Japanese comparative advantage of producing *i* over the world. (Source) United Nations Conference on Trade and Development

machinery and the electrical machinery tend to diminish the comparative advantage after 1995. The comparative advantage of transport equipment tends to increase up to 2008. But its comparative advantage finally started to diminish in 2009.

In addition the import penetration rose sharply in 2009 similar to the increase in 1995-1996 (Figure 18). Furthermore, the ratio of output price to input price in manufacturing, namely the terms of trade at the enterprise level declined as a trend since the mid-1990s with exception of precision machinery. A sharp drop of the terms of trade implied a strong reduction of mark-ups, notably in iron and steel and electric machinery. These industries are exposed to fierce competition with Korean and Chinese exporters. The real effective exchange rates in Korea and China continued to decline sizably as a trend since the 1970s or the 1980s (Figure 13, 14).

In contrast, Germany maintained its export share on the world market at the same level as that of early-1990s by maintaining the stable real exchange rate, thanks to the lower nominal euro rate judging from the international competitiveness of German exporters within the euro area^[8]. German export industries have been well-protected by the introduction of the euro.

Figure 18: Cyclical Component of the Import Penetration in Japan



(Note) The cyclical component of the import penetration was identified through Hodrick-Prescott filter ($\lambda = 1600$).

(Source) Ministry of Economy, Trade and Industry; Bank of Japan

V. Choice of Invoice Currency

Three Options

There are three options for monopolistic exporters facing the exchange rate uncertainty in invoicing the transaction. The currency used for trade contracts is referred to as the currency of invoice.

Given wide and rapid exchange rate fluctuations under a floating exchange rate system, it could be very costly for exporting firms to re-optimize offer prices at the time when the exchange rate changes. It seems reasonable to assume that exporters have to set prices before the exchange rate is known; then, the demand is a function of the price that importers face after the exchange rate uncertainty is removed. Conversely, if exporters set prices after the exchange rate were known, choice of invoice currency would not affect the profit functions of exporting firms differently^[9].

Producer Currency Pricing

The first option for exporters is to set their export prices in home currency. The export price is P_1 , irrespective of exchange rate changes. In the literature it is termed

“producer’s currency pricing” (PCP).

In the case of PCP, the pass-through is 100%. This implies wide fluctuations of import prices. In reality, import prices change much less than the exchange rate.

Under PCP, both the “law of one price” and the purchasing power parity hold. Furthermore, the terms of trade immediately worsens as the exchange rate depreciates, because the terms of trade under PCP can be expressed as below;

$$\text{Terms of trade} = (P_1/P_2) = (P_1/EP_2^*)$$

The depreciation of home country implies the higher level of E and thus worsens the terms of trade of the home country.

Under the assumption that exporters do not hedge the demand risk by buying forward contract in his own currency, the offer price is higher, due to the exporter’s risk aversion^[10]; the optimal price is set independently from the shape of utility function or the stochastic properties of exchange rate (“separation theorem”, except for the specific demand function).

Local Currency Pricing

The second choice is to set the price in the currency of the destination country (local currency pricing, LCP). By definition, the exchange rate pass-through is zero. Implicit assumption adopted here is the perfect price-discrimination by exporting firms or the market segmentation across the border. As a result, both the law of one price and the purchasing power parity does not hold in the presence of nominal price rigidities.

In addition, by using the forward market and setting price in importing country currency, exporters can fully avoids risk and achieves the same profit as that under certainty. If the forward markets are efficient, exporters will hedge fully. In the case of LCP with hedging on forward market, the offer price by exporters does not depend on the shape of utility function or the stochastic properties of the exchange rates (“separation theorem”).

Under LCP, the exchange rate depreciation is immediately accompanied by the improvement of terms of trade in home economy, because the export price is set in local currency as denoted by P_1^F .

Under LCP, the terms of trade can be expressed as below;

$$\text{Terms of trade} = (P_1/P_2) = (EP_1^F/P_2^*)$$

The depreciation of domestic currency (namely, the higher level of E) leads to the improvement of terms of trade, while worsening the terms of trade of foreign country. This is exactly opposite to that of the PCP case. It must be noted that the law of one price does not hold, because P_1 is different from EP_1^F . The terms of trade changes to depreciation/appreciation can be summarized in Table 6. It may be noted that the

asymmetric use of PCP and LCP results in no change in the terms of trade as pointed out by MacCoille et al. (2010).

On the other hand the uncovered interest rate parity can still hold, if we assume the international bond trading trade. The differentiated response of the terms of trade to exchange rate changes carries with it important implications for the international transmission of monetary policy and its impact on the national welfare discussed in the section VI.

Pricing-to-Market and the LCP

The choice of invoice currency is often discussed in relation to the practice of the exchange rate pass-through or the “pricing-to-market” (PTM) practice adopted by exporting firms.

From the perspective maximizing profits under the exchange rate uncertainty, exporters can stabilize demands on foreign market by choosing LCP and engaging in less than full exchange rate pass-through. Indeed, choice of invoice currency depends on the same factors (relating to the demand and cost functions) that determine the exchange rate pass-through^[11].

Knetter (1993) provided empirical evidence that the destination-specific export price adjustment offsets 48 percent of the impact of exchange rate changes on price in the buyer’s currency for Japanese export. For Germany and the UK the number is 36%, while for the US, it is zero.

It is understandable that the US terms of trade have co-moved with the exchange rate changes. Both exports and imports are invoiced in dollar; the exports share of dollar as invoice currency is about 90%, while the imports share is close to 100%.

Conversely, the exchange rate pass-through by Japanese exporters on to export prices is 52% which is much lower than the numbers of the US, UK, German exporters. The difference may reflect the degree of product differentiation and the shape of profit functions among exporters of different countries.

Further, it may be due to the increasing share of intra-firm transactions and the market share considerations among Japanese exporters, aside from the role of yen as an international currency.

Empirical evidences show that the “mark-to-market” practice or the low exchange rate pass-through is positively associated with the choice the local currency (LCP) as an invoice currency. In other words, under LPC, exporting firms tends to choose the local currency as an invoice currency.

On the other hand, the study by the Cabinet Office reported that the exchange rate change pass-through was estimated to be about 30-40% during the period from 1983 to

1990. But the share of the “pass-through” dropped to about 20% in the 1990s. Then it has recovered to about 40-60% in the latter half of 2000s. The share of yen as invoice currency in the Japanese exports showed gradual increase during the period under observation. Thus, the size of pass-through seemed to be affected not only by the choice of invoice currency, but also other economic conditions prevailing in world economy.

Choice of Third Currency Pricing

The third is option for exporters is to choose a third country currency as an invoice currency. Many Asian countries adopt the US dollar as invoice currency. Goldberg and Tille (2005) confirmed that the use of dollar as an invoice currency in country trade with non-US counterparts is tightly correlated with the prevalence in a country’s exports or imports of transactions in the organized-trade such as commodities and precious metals and reference priced goods such as chemical products.

The organized exchange good has an overt market, while the reference good is a homogeneous good that has not an official market, but that has reference prices that are published in trade magazines. On these markets, the firm is a price taker. The exchange rate uncertainty easily results in commodity price uncertainty.

We also observe that the exports of differentiated goods tends to be invoiced in the exporting country currency, as compared with the organized exchange goods and the reference priced goods that are dominantly invoiced in the US dollar.

Role of Vehicle Currency

In selecting the vehicle currency which facilitates the international transaction in the foreign exchange market, the network externality and low transaction costs coupled with the presence of inertia influence the choice of currency as mediums of exchange (Krugman (1980)). Low transaction costs are associated closely with a high degree of liquidity in the foreign exchange markets and domestic financial markets.

In the case of the use of vehicle currency, there exists the effect of stochastic changes of the third country’s exchange rate on demand. The exporter will prefer LCP, as they can fully insulate from risks by using forward currency market. But the exporter will prefer pricing in a vehicle currency to pricing in home currency, if the vehicle currency has low variance relative to domestic currency.

Actual Use of Invoice Currency

It is interesting to note that the share of dollar-invoiced export in Japanese exports is 47.4% in 2009, while the dollar-invoiced share in US export is 95% in 2003. In the case of Germany its share is 32.3% in 2002 (Table 5).

Table 4: Share of Invoice Currency (Japan, end of 2009)

Exports (%)	World	\$: 47.4	¥: 42.2	€: 6.5
	US	\$: 83.1	¥: 16.8	€: 0.1
	EU	€: 49.3	¥: 31.7	\$: 15.2
	Asia	¥: 49.3	\$: 48.6	B: 0.6
Imports (%)	World	\$: 72.1	¥: 23.2	€: 3.2
	US	\$: 77.5	¥: 21.9	€: 0.4
	EU	¥: 57.8	€: 28.5	\$: 10.6
	Asia	\$: 71.6	¥: 26.8	B: 0.5

(Note) \$, ¥, € and B indicate the US dollar, the Japanese yen, the Euro and the Thai baht respectively.

Table 5: US dollar Use in the Export and Import Invoicing

Country	Year of observation	US \$ share in Export Invoicing (%)	US \$ share in Import Invoicing (%)
US	2003	95	85
Japan	2009	47.4	72.1
Korea	2001	84.9	82.2
Malaysia	1996	66	66
Thailand	1996	83.9	83.9
Australia	2002	67.9	50.1
UK	2002	26	37
Germany	2002	32.3	37.9
France	2002	34.2	43.2

(Source) Goldberg and Tille (2005); Ministry of Finance, Government of Japan.

Table 6: Terms of Trade Changes in Response to Exchange Rate Changes

	Foreign Country: PCP	Foreign Country: LCP
Home Country: PCP	Depreciation: – Appreciation: +	Depreciation: 0 Appreciation: 0
Home Country: LCP	Depreciation: 0 Appreciation: 0	Depreciation: + Appreciation: –

On the other hand, the yen-invoiced share of Japanese exports shows gradual increase from 36.1% in 2000 to 42.2% in 2009 ^[12]. On the Japanese imports, the dollar is dominant invoice currency, in part reflecting the fact that commodity prices are denominated in dollar. The dollar-invoiced share is at 72.1%, while the share of yen-invoiced import in total imports hovers around 20-24% (Table 4).

It is important to note that the choice of price setting behavior affects the movements in the terms of trade and the international transmission of monetary policy. Both the exchange rate pass-through and the choice of invoice currency suggest that not only PCP but also LCP plays important role in firm's price setting of world economy, with the exception of the US. Even the mixed use of PCP and LCP may constitute one of the sources which create deviation from the law of one price and the purchasing power parity.

VI. Difference in International Transmission of Monetary Policy

New open-economy macro-economics provided a new insight into the international transmission of monetary policy. Under the condition of nominal price rigidities, the transmission mechanism is influenced by different price setting behavior which is linked to the choice of invoice currency.

It is also important to discern the effect on nation's welfare from the effect of production and employment. Although the effects of monetary expansion on employment and production are the main focus in the political debate, it is crucial to watch the effects monetary expansion on the terms of trade of respective countries and the world real interest rate in assessing the effect on economic welfare.

On the welfare effect of international transmission of monetary expansion based on the model of new open-economy macro-economics, the main results in the literature can be summarized as follows (Obstfeld and Rogoff (1995), Corsetti and Pesenti (2008); Betts and Devereux (2000)).

(1) If all domestic and foreign exporting firms adopt PCP, then the changes in exchange rate affect the export price in foreign economy through 100% pass-through effect. The 100% pass-through raises home currency price of imports, while it leaves the export price unchanged; thus it results in worsening the terms of trade in home economy. Higher import prices work to expand domestic production, thereby reducing the foreign production. At the same time the current balance improves in domestic economy, while that of foreign country deteriorates.

The deterioration of the home terms of trade will not necessarily affect the domestic labor supply; the income and substitution effect tend to offset each other,

and domestic labor supply is completely shielded from changes in the terms of trade in the case of Cobb-Douglas utility function.

Foreign consumers can enjoy a higher level of consumption for an unchanged level of labor effort; the terms of trade improvements more than offset the reduction in production (Obstfeld and Rogoff (1995), Corsetti et al. (2000)). Thus, it is unlikely that the domestic monetary expansion causes the “beggar-thy-neighbor” effect. The expenditure switching effect (which shifts world demand from foreign goods to home goods) works to dampen the volatility of exchange rate by reinforcing the re-allocation of resources. The optimal monetary policy to maximize the world welfare can be conducted without international policy coordination.

- (2) If all domestic and foreign exporting firms adopts LCP as price setting behavior, then changes in the exchange rate does not affect the export price denominated in foreign country currency. The terms of trade changes due to the exchange rate changes; depreciation raises the home currency price of exports, but leaves imports price unchanged. This results in improvements of terms of trade in home economy, contrary to the observation that depreciation is usually accompanied by deterioration of terms of trade.

Changes in exchange rate involve no expenditure switching effect. The trade balance is left unchanged in the absence of expenditure switching effect. Depreciation of home currency, however, raises mark-up over the marginal costs in terms of domestic currency, and reduces mark-up of foreign firms; it shifts a world income distribution toward the home economy. The home consumption increases relative to foreign consumption. As a result, domestic monetary expansion always improves domestic welfare through improvements of terms of trade combined with increase in domestic income and production; the welfare of foreign country is lowered through worsening the terms of trade, although foreign production increases due to the lower real world interest rate and the expansion of world consumption. The terms of trade deterioration offsets the increase in foreign production, leaving the foreign income unchanged. Instead of expenditure-switching effect, the switch of the labor burden gives rise to the “beggar-thy-neighbor” effect. Foreign country workers need to work more to sustain the same level of consumption. The adoption of LCP increases the cross-country correlations of production, but it reduces that of consumption.

Moreover, given the absence of the expenditure switching effects, the adoption of LCP will result in higher volatility of overall exchange rate movements in response to unanticipated monetary and fiscal shocks; each central bank attempts to stabilize the changes in marginal costs of home economy. Facing the large

Table 7: Spillover Effect of Monetary Expansion on Welfare

	Foreign Country: PCP	Foreign Country: LCP
Home Country: PCP	+	+ or -
Home Country: LCP	+ or -	-

volatility of exchange rates, the foreign producers raise the mark-up rate on export prices. In order to stabilize the marginal costs in the two countries, it is suitable to stabilize the exchange rate changes. This points to the advantage to choose the fixed exchange rate regime under LCP rather than flexible exchange rate regime (Devereux and Engel (2003)).

The optimal monetary policy to maximize the welfare in domestic economy depends on the conduct of foreign optimal monetary policy. Under the assumption of the symmetric objective function for the two central banks, there is no need for international policy coordination. International policy coordination is, however, needed in the case of asymmetric and mixed use of PCP and LCP in the two countries (Corsetti and Pesenti (2008)).

- (3) The story becomes more complicated if one country adopts PCP, while the other adopts LCP, in addition to the mixed use of PCP and LCP.

By incorporating the asymmetry and mixture cases into the Obstfeld-Rogoff model, Otani (2002) argue that whether the beggar-thy-neighbor effect is generated or not depends on the share of LCP, the value of elasticity of substitution and the size of country ^[13].

Table 7 summarizes the above results. We should be cautious that the spillover effect of domestic monetary expansion can be actually accompanied by worsening welfare in foreign countries. It should be noted that the IMF spillover study focuses on the effect of monetary policy on production in foreign countries rather than welfare. Moreover, if the LCP dominates the world economy, it is sensible to have more stable exchange rate regime. Given the model-based results, let us turn to the evaluation of the spillover effect of monetary expansion in Japan in comparison with other countries.

Japan's Unconventional Policy Measures

In the period of the BOJ's first round of unconventional policy measure, nominal/real yen rate depreciated as a trend. But the nominal/real depreciation was accompanied by the deterioration of terms of trade. This implies improvements of terms of trade of trading partner countries.

In the second round of unconventional policy measures, nominal/real yet rate

appreciated sizably, reflecting relatively small adverse effect of financial market disruptions, relatively modest monetary expansion and the role of yen as safe haven currency. Despite the nominal/real yen appreciation, the Japan's terms of trade again continued to deteriorate. It is unlikely that Japan's monetary expansion caused the beggar-thy-neighbor effect, but it is not excluded that Japanese industries suffer from excessive overshooting of yen rate again by the combination of real yen rate appreciation and worsening terms of trade.

Recent US Monetary Expansion

It seems that US monetary authorities regards the US monetary expansion as beneficial to all the trading partner countries, implicitly assuming that PCP is adopted by not only the US firms but also all the firms of trading partner countries.

However, the commodity prices reacted to the US extra-ordinary monetary expansion. The commodity market, notably the oil market, was financialized by the participation of various funds including hedge funds, commodity index funds and pension funds (Iwata (forthcoming)); the fund managers aimed at enhancing the investment in commodities as an alternative investment to traditional equities and bonds investments since the mid-2000s. The commodities turned out to be liquid assets whose prices are determined on the forward market.

Oil price rise accelerates the worsening terms of trade triggered by domestic monetary expansion. In April 2011 the US gasoline price rose close to 4 dollar per gallon, the threshold price to dampen the consumer spending.

In May, Chicago Mercantile Market raised twice the margins on forward market to prevent the speculative, forward-market-led acceleration of oil prices. Moreover, the emergency release of oil stock by the IEA member countries in June and July slowed down the pace of oil price increase. These two measures suggest the usefulness of additional policy weapon to ward off the adverse international repercussion.

These measures mitigated the adverse effect from the deterioration of the US terms of trade. Certainly, the commodity countries enjoyed the improvement of terms of trade. If the US terms of trade worsened more sharply by more sharp increase in oil price which dampens consumer spending, a strong monetary expansion could bring about the "beggar-thyself" effect through international repercussion ^[14]. However, moderate dollar depreciation brings great comfort to the US in strengthening the international competitiveness of the US firms and the revaluation effect of foreign-currency- denominated assets holdings by the US residents.

The international repercussion effect of US monetary expansion on oil prices appeared already in 2007-2008. The US economy entered recession in December 2007

before the Lehman's bankruptcy. Hamilton (2009) argued that the recession from the fourth quarter of 2007 to the third quarter of 2008 was triggered by higher oil prices. In other words, more modest monetary expansion could have served to avoid the recession. Actually the Federal Reserve stopped temporarily cutting the policy rate in the period from June 2008 to September 2008. On the other hand, the ECB raised the policy rate in July when the oil price peaked. But the ECB faced immediately the risk of recession in autumn and cut the policy rate in October.

Depreciation of Real Sterling Rate and Appreciation of Real Yen Rate

As already pointed out by Broadbent (2011), it is possible that a sharp depreciation of the sterling in 2007-8 was not caused by monetary expansion. But we should note that the BOE carried out a sharp reduction of policy rate from 5% in the late-2008 to 0.5% in the early-2009. Therefore, expansionary monetary policy in terms of lower policy interest rate contributed in part to the depreciation of nominal exchange rate.

Broadbent pointed to a sharp expected decline of expenditure on non-tradable output which supposedly brought about a sharp depreciation of real five years forward sterling rate.

Within a framework of new open-economy macro-economic model, the exchange rate changes are determined by the uncovered interest rate parity. As a result, real exchange rate is determined by the difference of ratio of money to consumption in the two countries. A sharp reduction in domestic consumption (erosion of purchasing power of domestic money) leads to the depreciation of real sterling ^[15].

In sharp contrast, Japan experienced "ever-rising real yen rate" after the bubble burst. In 1990 the Japanese government made a commitment in a dialogue of the US-Japan structural impediments to expand the accumulated sum of public investment to 430 trillion over the coming ten years, in response to the US request on domestic demand expansion to reduce the bilateral current account balance. The ratio of public investment to nominal GDP increased sharply from 1990 and reached peak in 1995.

After the asset price bubble burst in 1990, the level of Japan's real GDP had never been below the peak of asset price bubble period, in contrast to the recent experience among major economies. Presumably, market expected the boost of demand for non-tradable output due to the increase in public investment coupled with the stable increase of consumer spending. Both of them could contribute to ever-rising real yen rate.

Yen Depreciation in the Latter Half of 1990s

Based on the three country model of 100% pass-through (PCP) similar to Corsetti et al (2000), Shioji (2001) examined the effect of yen depreciation during the latter half of the 1990s on the welfare of Asian countries.

It is easy to see from the insight based on the model that the yen depreciation through Japan's monetary expansion improves the welfare of Asian countries, although Japan's monetary expansion can possibly exert adverse effects on the production of Asian economies. But the outcome would be affected by changing the assumption on the price setting behavior by Asian exporting firms; it is likely that they adopt LCP rather than PCP.

In addition, it is dubious whether the yen depreciation during the course of 1995-98 was really caused by monetary expansion in Japan. The BOJ maintained the policy rate at low level close to zero after December 1995. The ratio of the size BOJ balance sheets to nominal GDP showed stable development, while the terms-of trade slightly worsened during the period under observation.

We conjecture that the yen rate depreciation was triggered by a remarkable turnaround of US exchange rate policy from weak dollar to strong dollar in the midst of the Mexican crisis in 1994-5. The US-Japan joint intervention to strengthen the US dollar caused a marked shift to expected depreciation of the yen/dollar rate. The yen depreciation tendency can be better described as movements toward the equilibrium level of the yen rate after the overshooting in the preceding period after the Plaza Accord.

On the other hand, if the yen depreciation was caused by negative productivity shock to tradable sector or the financial market shocks in Japan, it is obvious that the Asian economies would be more seriously affected ^[16].

VII. Conclusion

The expansion of central banks' balance sheets and its composition changes were designed to mitigate the impact arising from adverse financial shocks. The unconventional policy measures were effective to rectify the market malfunction and stabilize the financial market. The central banks acted as a lender of last resort as well as the last market maker. But the unconventional policy measures adopted by the BOJ have not succeeded in reversing the persistent deflationary tendency with the limited effect on aggregate demand.

The benefit of unconventional policy measures is accompanied by the costs; the market distortions created by central banks' massive asset purchase are likely to induce

the misallocation of resources, aside from the risk of loosening fiscal discipline through easy monetization of budget deficit.

This paper explored the possibility of adverse international transmission of monetary expansion through the changes in exchange rate and the terms of trade; the terms of trade changes constitute one of the most important channels to transmit domestic monetary expansion to abroad.

Under the assumption of pre-set pricing, the price setting behavior by exporting firms plays a critical role in determining the terms of trade changes in response to exchange rate changes. The terms of trade deterioration in the US and no change in UK and the Euro area may imply limited effect of monetary expansion of advanced economies on the welfare of emerging economies. In the case of Japan, sharp real yen appreciation has been accompanied by worsening terms of trade, exerting beneficial impacts on the welfare of trading partner countries.

More recently, capital flows reversed to advanced economies from emerging economies, reflecting the risk-off behavior by global investors triggered by fiscal crisis in the Euro area. Now some of the emerging economies face the risk of sudden capital outflow and downward pressure on the exchange rate of domestic currency. More harmful is the effect of financial market disruption in financial centers on emerging economies. It seems desirable to strengthen the international coordination of dollar liquidity provision, centering the IMF to prevent the excessive volatility of exchange rates among major economies ^[17].

Footnote

[1] Facing a tremendous market stress and disruptions, the Bank of Japan embarked on the zero interest policy (the ZIRP) in February 1999 where the announcement on the duration of zero policy rate was made with the aim of affecting the longer interest rates through the market expectation channel.

With the hindsight we may argue that the termination of the ZIRP in August 2001 was premature, since the Japanese economy entered the recession in October 2001; the recession in Japan was caused in part due to the IT bubble burst in the United States in April 2001.

Moreover, the condition to terminate the ZIRP was not transparent enough; Governor Hayami noted that the ZIRP will be sustained until the fear about deflation disappears. When the ZIRP was ended, the consumer price rate continued to register the negative rate of changes. Presumably, the deflation of about one percent was not identified as deflation. It seems to me that the “deflationary spiral” during the Great Depression which was accompanied by 20-30 percent unemployment rate was defined as deflation (Iwata (2010)).

[2] See Taylor (2008) in details on the implicit exchange rate target range proposed by Mr. Zenbei Mizoguchi, the then Vice-Minister of MOF.

[3] Dr. Ryuzo Miyao argued at the conference that the deflationary expectation has been removed since mid-2000s by citing the survey report on inflation expectation in Japan. Yet, the break-even rate derived from index bond has shown persistent deflationary expectation, although the market of index bonds is not well-developed in Japan.

[4] The Fed introduced a system of reciprocal currency arrangements, dollar swap line program, with the ECB and the SNB in December 2007; its function was similar to the Term Auction Facility as an instrument to implement the role of stabilizing the financial market as a “lender of last resort”.

The first phase in the period between December 2007 and September 2008 aimed at achieving the role of the instrument to extend the TALF to overseas financial institution, while the second phase from September to October in 2008 included the participation of the BOE, the BOJ, the BOC, the RBA, the SR, the NB, the DN, the RBZW, the BCB, the BM, the BOK, and the MAS; the Fed expanded the program in size and scope; the available amounts rose from \$67 billion to \$620 billion.

The BOJ joined the arrangement of the third phase in the period from October 2008 to February 2010. In the case of Korea the Bank of Korea loans funded by the swap arrangement with the Fed was more effective in stabilizing financial market than the use of its own foreign reserve. This is because of the market confidence and the

virtually added amount of foreign reserves (Baba and Shim (2010)).

At its peak, total available amount increased to \$580 billion which took on the share of 25% in total asset holdings by the FRB. In between in September 2009 the Fed opened the foreign currency swap lines with the ECB, the SNB, the BOE, and the BOJ which enabled the Fed to provide liquidity in foreign currencies to US financial institutions. In the face of deepening fiscal crisis in Europe, the dollar swap arrangement entered the fourth phase in May 2011.

[5] The empirical evidence based on event study does not provide support that they announcement of LSAP 1 and 2 pushed up energy prices (Glick and Ludec (2011)). Yet, it is not excluded that the demand for energy accelerated by the expansion of emerging economies through the US stimulus measures.

[6] On more rigorous derivation based on production function, see Obstfeld (2011), pp.72-77

[7] Yet, he also added that the real yen rate against Germany is more consistent with the HBS theory. Moreover, Lane (2011) confirmed the possibility that the real exchange rate might appear to be co-integrated with the relative productivity variables. Dekle and Fukao (2011) find more evidence than does Obstfeld (2011), by adding the low productivity manufacturing sector to the model in Japan and the US.

[8] The productivity differential between traded and non-traded sectors is larger in accession economies than Euro member economies. The relative price of non-traded good to traded goods is higher in the accession countries. Then overall inflation rate will be higher at a given exchange rate. This leads to appreciation of their real effective exchange after participating in the Euro-system.

[9] Friberg (1998) noted that under the pre-set pricing framework, the invoice currency functions as the store of value, after the price is set in some currency which functions as the unit of account. The medium of exchange function of money is fulfilled by the currency of payment. Normally, the same currency is used as invoice and payment currency.

Bacchetta and Wincoop (2002) argued that within the partial equilibrium framework, the choice between PCP and LCP depends on the shape of profit function whether it is convex or concave in price (exchange rate) changes; a monopolistic firm chooses PCP, when the profit function is convex and the product differentiation is high. It chooses LCP, when the profit function is concave and the product differentiation is low.

[10] Friberg (1998) noted that the exporter usually does not hedge against demand risk by buying forward contracts in his own country. Yet, it is not excluded that the multi-national firms such as trading companies hedge against the demand risk on

forward market.

[11] Friberg (1998) demonstrated that sufficient conditions for choosing local currency as an invoice currency is the same as the conditions requiring the exchange rate pass-through of export prices to be less than one.

[12] Grassman (1973) found that the producer's currency tended to be used as the choice currency in trade of Sweden and Denmark (the "Grassman's Law").

[13] If all the Japanese exporters adopt LCP and the local currency pricing and all the US foreign firms employ PCP, the US monetary expansion exerts a greater influence on the US domestic consumption. But the Japanese monetary easing will influence little on the US consumption.

Under the assumption that the 100% US exporters adopt PCP with less than 50% by Japanese exporters, Japan's monetary expansion can exert a welfare reducing effect on the US economy, if the value of elasticity of substitution exceeds the value of 8.37. But the size of international transmission effect of Japanese monetary policy on US welfare is negligibly small, as compared with that of US monetary policy. On the other hand, both Japanese and US monetary expansion have beggar-thy-neighbor effect in the case 50% LCP adopted by Japanese exporters (Otani (2003)).

[14] Corsetti and Pesenti (2001) has already pointed out the possibility that domestic monetary expansion can reduce the domestic welfare if the openness is high and the elasticity of input substitution is not so small under the PCP.

[15] In the conversation with Ippei Fujiwara, he made this point more explicit.

[16] The simulation outcome may be changed, if Japanese and Asian firms adopt LCM in their exports and less than one pass-through takes place. But it seems difficult to assume that the Japanese firms prefer LCP to PCP, given the limited room of hedging on the Asian forward market, with the exception of Korea.

[17] In process of preparing the G20 Summit Meeting, the Korean government insisted to construct the global financial safety network as a prevention measure of global financial crisis. As was pointed out by Ms. Lagarde, the IMF's "one year forward commitment capacity" amounts only to 246 billion SDRs (\$38 billion or €280 billion). This is equivalent to 15% of Italian government debt outstanding.

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